

AVIATION WEEK

A MCGRAW-HILL PUBLICATION

JUNE 7, 1954

50 CENTS

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protection
starts here!



"START JET ONE!" That order from a Strategic Air Command pilot starts more than engines... because every time a B-36 is ready for flight, it's your *American freedom* that becomes operational, not just an aircraft.

But it doesn't all begin in the cockpit. Birthplace of the B-36 is on the Convair assembly lines. Here the world's largest bomber is built with such efficiency and economy, that Convair alone has been awarded development and *production* responsibilities unique in the history of aircraft manufacture.

Just as the U. S. Air Force B-36 has changed the entire concept of strategic warfare, its rate of *production*, meeting every scheduled requirement, has set new standards for airframe manufacture.

At Convair, the aim is to develop and PRODUCE the maximum of air power... Engineering to the Nth power

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CONVAIR



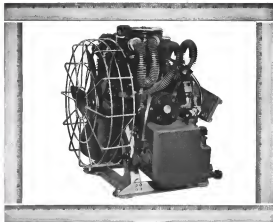


Within Seconds After Warning . . .

the Lockheed Starfire is in the air and on its way to altitudes of more than 45,000 feet. Holley designed and manufactured the turbine fuel control and the afterburner fuel control used on the F-94C's Pratt & Whitney Aircraft J-48 Jet Engines.



LEADER IN THE DESIGN, DEVELOPMENT
AND MANUFACTURE OF AVIATION FUEL
METERING DEVICES



NOW IN PRODUCTION!

11½ pounds of pneumatic power . . . in a 10" envelope!

Now available to the aviation industry, Kidde's new 4-D compressor represents the latest development in the field of pneumatic—a statically and dynamically balanced compressor that weighs in at just 11½ pounds . . . with an envelope of only 10 inches!

At sea level, Kidde's 4-D compressor will deliver 4 cfm of free air compressed to 3000 PSL. Pressurized from a jet engine, it will also deliver 4 cfm at altitude. Unpressurized, it delivers 5 cfm at 50,000 feet. Also available is Kidde's 4-D2, a modification of the 4-D. The 4-D2 has a pressure relief valve, and at sea level will deliver 2 cfm, compressed to 3000 PSL. Above 15,000 feet, the delivery of the 4-D2 is identical with Model 4-D.

Kidde also offers you a complete line of pneumatic system components: back pressure valves, moisture separators, pressure switches, pneumatic fuses, control valves, chemical driers and filters.

If you have a problem in pneumatics, or wish to know more about the new 4-D and 4-D2 compressors, write Kidde today.

Kidde

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HOW MUCH DOES AN OVERHAUL COST?

finally

It costs more than just the price charged by the overhaul shop. Delays in engine delivery pile up expensive ground time. Scaff, not quite right fits and adjustments add "mechanic" time and pilot annoyance throughout the service life.

The total of all these things make up your true overhaul cost. An Airwork overhaul eliminates these secondary costs. That is why an Airwork overhaul, whether of engine or engine accessories, saves you money!

Airwork provides factory new performance—every component is rebuilt, tested and suspended to the highest standard of dependability. Production line techniques equal to those of the original manufacturer are used—because that is the only way to get any varying quality.

A production control board charts actual daily progress of your engine through Airwork. Potential troubles are spotted and eliminated before they can become bottlenecks. That is why you get on-time deliveries of your engines.

The proof of it all lies in the acceptance of Airwork as the prime overhaul base for 6 scheduled airlines—the people who know total overhaul costs best of all.

Airwork has 21 Class A Dealers who will be glad to handle your overhaul and supply problems. Ask them about Airwork's Personalized Service, and the Airwork exchange program.



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Domestic

Scramjet Airbus System is expected to begin operations over its long sought transport route from Geneva to Los Angeles this fall. The U. S. State Department, with Civil Aeronautics Board approval, has offered the Scramjet government, the transport route on a reciprocal basis for a three-year period (AVIATION WEEK Mar. 26, p. 59).

John P. Riddle, founder and former president of Pacific Airlines who sold the airline's assets a year ago, has repurchased sufficient stock to regain control. He was appointed executive director of the company's executive committee following the transaction. A recent report by Riddle quotes him as saying the airline "is growing steadily under the presidency of William R. Boyd," who succeeded Riddle last July.

"Extensive" windtunnel, capable of testing aircraft and engine designs at from 400 mph to three times the speed of sound, will be constructed by North American Aviation near its Los Angeles plant. Estimated cost: \$4.5 million.

Two USAF subcontractors involving parts and subassemblies for Boeing Aerospace Co.'s B-47 and KC-97 have been transferred from Boeing Aerospace to Chrysler Corp., both of Detroit. Indefinite sources say the contracts originally were let for \$15 million and later increased to \$21 million. Terms of the Chrysler agreement are not known.

Ryan Aeronautical Co.'s Electronics Division is developing an airborne, self-contained helicopter hovering control under a Navy-Baker contract.

169 turboprop, Continental Aviation & Engineering Corp.'s version of the Pratt & Whitney Mainline, will be built for USAF under a contract covering production tooling and manufacture of the powerplants. The 169 is scheduled to power Canada's T-17 trainers.

Strotz's naval aircraft of low-power emergency (TVORs) will be set up in Minnesota's Department of Aeronautics. The agency decided to buy an TVOR following tests at the Austin Airport (AVIATION WEEK Feb. 8, p. 85). State and local governments will share installation expenses, but cities and industry will finance cost of operation and provide necessary manpower.

Military Air Transport Service set a



Strotzjet Tests Retractable Rate Units

A Boeing B-47C Stratojet medium bomber takes off with its rate units now retractable liquid propulsion rocket units called the most powerful ever designed for aircraft by their maker, Aerojet-General Corp., Azusa, Calif. The units are fitted to pods on the side of the fuselage, which swing open when in use. Performance data on the company's new Rate division still is classified by the U. S. Air Force.

safety record of more than 739,000 passenger miles without a fatality during the 17-month period ended May 31.

Bell Aircraft Corp., Ft. Worth, Tex., reports it received a record total of 41 commercial orders for Model 47C copiers in the first quarter of 1956. Sales represent a total of \$2.5 million, with 12 of the craft going to foreign buyers.

Navy has ordered an undetermined number of Ryan Pacer gyroscopically-actuated, designated RDA-1, with deliveries planned to start late this spring. Navy will use RDA-1 to support direct anti-aircraft, aerial proximity and guided missile training.

Paul R. Bonick, 56, co-founder of Bonick Airways and founder of Oklahoma's first commercial airline, died last week in Oklahoma City. He was a brother of the late Vincent E. Bonick, who was killed in a private plane crash last January (AVIATION WEEK Jan. 15, p. 20).

Financial

For American World Airways reports net earnings of \$585,910 for the first quarter of 1956, compared with a loss of \$63,571 during the first three months of last year. Commercial revenue increased 4.6% to \$16,897,000.

International

New Japanese jet fighter has been designed by Sasei Aircraft Co. for the Swedish air force, is scheduled to follow the J-29 (Frog Bone) on the company's Landing assembly line in the Detroit suburb. To bridge the gap between the 650 mph J-29 and Sasei's new J-35 Dragon, Sweden plans to use a modified jet fighter from a foreign producer.

Bello Coaster, four-place lightplane designed for landings and takeoffs in small fields, will be produced and sold in Canada by Fleet Manufacturing Ltd., at 25 E. Ave., Oak, under license by Helio Aircraft Corp., Boston.

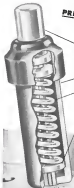
Canada's aircraft industry has private capital investments totaling 175 million, including more than 50 million from Britain, latest government estimates reveal. Backing these investments are millions in public funds, spent for special tools and construction facilities not otherwise available to the industry.

Canadian Aeronautical Institute has been formed to coordinate activities of all Canadian industrial aviation groups. Allied with the Royal Aeronautical Society of England and the U. S. Institute of the Aeronautical Sciences, the new group has headquarters in Ottawa and branches in Toronto and Montreal.

MONOGRAM SHEET METAL CLAMPS

HOLD TIGHT!

—because of this
PRECISION CONSTRUCTION



FRUSTE—Extremely close tolerance is maintained between the cone and plugger securing movement of plugger in a straight line at all times which is a necessary feature for smooth operation and long life

CRK—One piece cone for greater strength. Proves parts possess greater durability

SPRING—Of highest quality tempered steel. Manufactured to apply greater tension than required in order to draw the material tightly together and ensure positive alignment at all times

RETAINING WASHERS—Premium made to operate freely in cone

WELD—Finest quality steel. Extreme care is taken in weld dimensional tolerance to .001, insuring a more precise relationship. Because of these close tolerances and perfect alignment of all parts, the machine always moves in unison and their clamping surfaces contact the metal simultaneously—important for perfect material holding

SPRINGING—Top quality steel. Tolerances are held exceptionally close for smooth, easy operation and correct engagement of the machine.



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6557 Niagara Street, Culver City, California

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40 Years' Service on B-47

New Standard for the B-57

MARMAR CHANNEL-BAND COUPLING



Boeing Airplane Company has specified the Marmar Channel-Band Coupling again... strong tribute to Marmar design and production skill. Specified throughout the aviation field, wherever maximum duty is required, Marmar stands ready to serve you with existing models or with designs for your special application.

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WHO'S WHERE

In the Front Office

Walter C. East, vice president and chief executive officer for Republic Aviation Corp., has just become general manager of the Farmingdale, N. Y., company following a job transfered by President Maasland.

F. E. Stone is now assistant vice president of Control Systems. **John L. Blackwell** has been appointed vice president operations.

Ed A. Winkler, assistant director. **William L. Koenig** has been elected vice president operations at Thompson Air Lines. **Robert B. Miller** has been promoted to assistant to the president of Northrup Aircraft, Inc., Hawthorne, Calif.

Changes

H. C. McGee, former director and systems development engineer for American Airlines, has joined Eastern Air Lines as assistant to the vice president engineering.

Victor Z. Bond has become assistant general manager of Ford Motor Co.'s Aircraft Division in Chicago, succeeding **Ben D. Mills**, who has been appointed assistant general manager of the Special Products Division, Detroit.

Robert J. Brown has joined Vickers Inc. in chief aircraft products engineer of the equipment section of its Engine and Aircraft Division. **Thomas D. Olin**, Jr., is vice manager in charge for the company's Dallas, Omaha and Los Angeles plants.

William Winkler has been named new technical manager of Pugh-Berger Inc., Baltimore, succeeding **Robert J. Schuman**, who resigned.

Julius W. Conner has been named up by Continental Airlines & Engineering Corp., Dallas, to quality control manager of the Manufacturing and Research Division.

Arthur C. Wyle has joined as purchasing agent and traffic manager for United Aircraft Corp.'s Hamilton, New York Division, Wallkill Landing, Conn.

Norman L. Wicker has been appointed director of Special Groups Corp.'s Industrial Department, Great Neck, N. Y.

John C. Greenbaum has become public relations officer for Percival Aircraft Ltd., Luton Airport, England.

William M. McQuinn has been promoted to Sales Aircraft Co. to assist production superintendent of the Manufacturing Division. **Sam Dyer**, Chief design engineer at C. C. Ruckelshaus, assistant general production superintendent at C. F. Goodrich, production superintendent for Building 11.

Honors and Elections

George F. Chaplin, vice president and general manager of Fairchild Engine & Airplane Corp. in Garden City, has accepted presidency of the American Production Forum to be held by the Society of Automotive Engineers next April in New York.

Col. Wilbert W. Walker, holder of the world's fastest speed record for jet aircraft (Aviation Week Jan. 15, p. 7), has received the O'Brien J. McQuinn Memorial Award from the American Legion's Air Service Post 538 in New York.

INDUSTRY OBSERVER

► General's XP-72 Sea Dart now is flying with two Westinghouse 165 turbojets replacing the pair of J34s used for original tests. The twin 146 pounds a total of about 12,000 lb. thrust for the delta wing, water-based fighter, an increase of more than 1,000 lb. thrust over the J34 installation.

► De Havilland's Gyron and Gyron turbojets are now producing about 15,000 lb. thrust on the test stand but it eventually is more at a 25,000-lb. rating. Gyron has a live-fire, compression ratio, extremely advanced semi-cannibal blade design and providing better than 25 deg. centrifugal compressor rise for each compressor stage. Mass airflow is about 500 lb. per second. Gyron was two turbojets which and overall engine diameter is about 40 in.

► Pratt & Whitney's progress to get the H-21 helicopter back into flying status received a major setback recently when the test model lost a black delta flight test at Edwards AFB, Calif. The test model H-21 incorporated 27 modifications ordered by USAF when it purchased the H-21s last February (Aviation Week Feb. 22, p. 15).

► Westinghouse definitely will move all of its aircraft gas turbine activities to the large government-owned plant at Kansas City and will use its present jet engine facilities near Philadelphia for other projects.

► Douglas, Lockheed, General Electric and Pratt & Whitney are working on design study proposals for a high-altitude jet tanker supported by USAF (Aviation Week Mar. 17, p. 20). Both the Boeing B-57 and the General B-58 will require overall refueling for long-range missions.

► General has awarded two more sub-contractor contracts in its XH-56 Hardier helicopter development program (Aviation Week Mar. 24, p. 13). Aircraft electrical power system will be provided by Westinghouse Sault Ste. Marie Division of Lansing, Ohio, and the photo-reconnaissance system will be developed by Fairchild Camera and Instrument Corp. at Syosset, N. Y.

► Bristol Aeroplane Co. has a development program for its Olympus X-1 compressor turbojet aimed to carry its output to 17,000 lb. static thrust. Original version of the Olympus was type tested at 9,750 lb. static thrust. An advanced model now is running on test stand at about 12,500 lb. static thrust.

► Douglas Aircraft has engaged the Washington engineering firm of Ray and Dole to study the transport helicopter and its potential market. Report will cover engineering problems and sales outlook.

► Helicopter manufacturers increasingly are becoming involved in manufacturing of major aircraft engine manufacturers to develop propellers specifically designed for helicopter installation.

► USAF feels doubts British reports recently published in a London review suggest that its units in Europe will be 112 Helicopter Division to be based under the offshore procurement program. The Division will be flown by pilots of European air forces participating in NATO.

► British Lockheed transport was tested recently by British's Airplane Division at Hagerstown, Md. Fairchild spokesman says company has no plans to build a Lockheed-type jet transport.

► Navy attributes higher operating costs for transport aircraft to increase in cost of high octane gas and the use of more low-engine aircraft. Cost of aviation gas for Navy increased from 15 cents per gallon in 1955 to an estimated cost of 19 cents in 1956.

► USAF auditors, for the first six months of fiscal 1954, have reported actual and recommended reductions in contract costs of approximately \$245 million. Air Force also reports that major contractors remain active for 34 to 4 years.

► Jet operations being flown for the Air National Guard will increase 250% during fiscal 1956.

► United Air Lines order of 25 DC-7s with auxiliary parts from Douglas Aircraft represents an investment of \$35 million.

Democrats Score Airline Merger Proposal

- Senators charge Administration program would let big trunklines gobble up their smaller competitors.
- But Murray says new plan would strengthen the air transport industry, not turn it over to a few giants.

By Katherine Jakobs

The Administration's program to reduce "uneconomic airline duplication of service" by encouraging mergers drew charges from Democrats of favoritism to "big boys and big business" when it was presented to Senate subcommittee and Foreign Commerce Committee by Commerce Undersecretary for Transportation Robert Murray.

The program calls for "prompt action by industry and government to effect route consolidations, mergers and other adjustments required to strengthen the industry and give it the fullest possible freedom for meeting a reasonable schedule for orderly withdrawal." Murray admitted.

"Choose Instrument—See. George Southern declared the Administration, a group the aged for small trunklines "to be picked up immediately by the big traditions." Southern, president, added, that the smaller lines be given "better steps" as they might become economic operations.

The suggestion that the Administration's course would lead "to a system of eleven empires."

Sen. Mike McNamara wondered "if we are going to have Pan American World Airways as a 'chicken nation' and leave the rest of the world to the big boys in the North Atlantic and have one line in the Pacific."

He pointed to "the shambles" which "gives over completely to the railroad field, and declared, "We want to keep small business alive as a matter of fact. It is the small boys doing it with new ideas that makes for economic progress."

Delayed Strength—Murray, staunchly defended the Administration's program, stating there is no intention "to hurt anyone in the public" as long as the transportation field over to "a few boys." Getting an act on whether airlines, as well as mergers, be made, would be considered by Civil Aeronautics Board in reviewing the airline route pattern.

"But there is only so much business to be shared, and even then to cover over a route 'leads to definite strength'."

Southern said that plan would "not only not prevent any new lines but would limit the number of existing lines (as a matter of fact)."

Sen. Andrew Schoepel supported Murray and acknowledged that "it cannot be held" that the Administration has any intention "to close the door to new enterprises who has the right to apply to CAA and have its case decided on its merits."

McNamara Fight—Murray opposed a complete review of aviation law, as proposed by the senator. McNamara said he recommended that the 1933 Civil Aeronautics Act be revised with amendments.

Changes representing the policy program of the Administration, McNamara's report (Aeronautics Week May 3, p. 12), he reported, will be introduced to Congress for action as the new law.

He pointed out that the McNamara bill is proposed to require contribution of regular and contract carriers as well as independent airlines to the new law.

McNamara said that the bill is proposed to require contribution of regular and contract carriers as well as independent airlines to the new law.

The proposed reorganization, McNamara said, "would assure government efficiency and economy. It would be made to meet to place major economic and operating responsibilities, such as those now carried by the CAA, in an agency independent of direct political supervision and control."

Such functions as acquisition of the Federal reserve, administration of the Federal Reserve, operation of Federal Reserve and safety enforcement program, he argued, are "entirely the responsibility of an association."



MURRAY: No plan for a few giants.

department and should be performed by those officers responsible to the President, rather than by an independent authority.

Control Problem—Re-establishment of an independent air safety board, he said, "would result in additional expense, additional government personnel, additional problems of inter-agency relationships, without any significant offsetting advantages."

Pointing out that the McNamara bill's provisions for contribution of non-regular and contract carriers are in line with the ACG recommendations, McNamara added:

"The most experience with non-scheduled operations points up the acute problem of attempting to apply one form of regulatory control to the portion of the industry, while permitting competition by other carriers which are not subject to similar control."

Other news reported by the Undersecretary:

- **Equipment service.** Murray opposed the proposal for issuance of "equipment certificates" for new operations without showing of "public convenience and necessity."
- He stated that such factors as the prospect for economic recovery, the relationship of a proposed new service to the economic soundness of existing air transport operations and the merit of satisfying new citizens to provide new services should be given weight. He

Air Policy Review

Split in the Air Coordinating Committee over federal financial aid for development of testing of a local service prototype aircraft was the principal difference between the report as accepted by President Eisenhower May 16 and the recommendations (Aeronautics Week May 3, p. 12).

The divergent prototype aid recommendations stated:

"The federal government should, by appropriate means, provide financial aid for the development and testing of a local service prototype."

Isolation Rebuttal

Strong reaction came from the Indian aviation followers, criticism of the Fiat T-36B contract as a report of efficient procurement made in Santa Springsville and Boulder (Aeronautics Week May 3, p. 15).

Points made by the Indian include:

- Manufacture of the first T-36B is "uneconomical" because of the "learning curve" in any manufacturing process. Payments cover more than just the aircraft and include development in tools, equipment and equipment on American standards and training of skilled labor.

- The two sections did not visit Fiat facilities, relied on a one-day inspection trip by committee chair, USAF and Foreign Operations Administration, ignoring approval of the Fiat contract, announced the program for two years.
- Statement that 72% of the Fiat workers are Caste means is inaccurate. It also is unfair because it takes that since the CIGIL union at Fiat is Red-controlled all members are Communists.

Policy Instrument

U. S. appears to have used as an instrument of national policy in South America, such as it was in the Berlin airlift—B-29 shooting at Soviet aircraft as landing near Moscow and Nicaragua from Brooklyn AFB, Mobile, Ala.

On Nicaragua, Amer Day three B-35 bombers from Carroll AFB, Ft. Worth, Tex., were on a training mission. They were the only B-35s in the world. The bombers and Mustangs (Perkins aircraft) offered no comment on the significance of the trip, but pointed out that it was done with approval of State Department. All this followed by a line day, departure of 1,000 tons of arms to Guatemala from behind the Iron Curtain.

Jet Education

Faced with serious complaints and lowest production at airports where jets operate, USAF has launched a pilot training program to promote better understanding of jet pilots' problems. Classes will be held at Craig AFB, Selma, Ala. and Moody AFB, Valdosta, Ga.

First students will include 13 new hires from Civil Aeronautics Administration and Civil Aeronautics Board and 12 other pilots, who will take one-week instruction time course. CAAA Administrator J. B. Lee will be in charge as "area officer" of instruction flying course, which will give him up to 10 hr. flight time on T-33.

Airport Incorporation

The Administration's plan to incorporate Washington National Airport is confronted with opposition by General Accounting Office, as well as airlines, making enactment this session unlikely. GAO is independent of the Executive Branch, reporting directly to Congress.

"It has taken Congress nine years since the passage of the Government Corporation Control Act to induce the problem of government corporations to the present situation," GAO attorney Owen Kase says. He argues that efficiency and economy can be accomplished at the National Airport without incorporating it.

Stuart Tipton, general counsel of Air Transport Association, opposing incorporation of the Administration has walked out on the details of incorporation, including the working capital fund to be set up and the value to be placed on the property. "These details, he pointed out, will have an effect on the fees to be charged airlines." "We would like to see what we are getting in for," he says.

Military Notes

Defense Department is not urging legislative relief for the airlines to offer free or reduced rates on military business, claiming that Civil Aeronautics Board already has authority to exempt carriers from such regulations.

However, the department has indicated it will support a provision in the 1949 Transportation Act allowing said to bargain an military business. Airlines complain that the rule have used that to undercut them on defense contracts.

The airlines, however, don't want a similar provision included in the surface bill, contending it only would create more chaos. Commerce Department is taking the position that Congress should rely on the proposal to amend the rule authority to offer reduced rates before consideration is given to applying this authority to airlines.

New Guard Standards

General tightening of Air National Guard standards is indicated in new personnel testing program to start in September. Similar to USAF personnel station, tests will aim to get best-qualified men as ever (Aeronautics Week May 3, p. 12).

USAF will have strong voice in tests because jobs will be supervised by them in industry, reported under Air Command. Rosen will be given brief a year in each career field, keeping each commanding officer fully posted on skill of men, their contribution for their jobs and qualifications to advance.

Interim Weapon

One of the main factors in the recent debate over the future of the XB-58 supersonic bomber development program was facing strong support USAF planners that construction is an interim weapon to bridge the gap between current subsonic bombers and the ultimate development of nuclear-powered military aircraft and intercontinental missiles with atomic and hydrogen bomb warheads.

—Washington Staff

questioned that CAB already has adequate authority to enforce new types of awards.

• **Regulation of security issues.** "If the government takes on the final authority for determining the wisdom of a post-bomber licensing program," Murray declared, in opposing the McCarran proposal for government control of airline security issues, "it must be the case that it takes more responsibility for any subsequent problems developing from

such a program-sustaining responsibility to allocate any problems through liability.

"It would be preferable to place the onus clearly on an airline that the government will not assist them from financial difficulties rather than attempt, through security regulations, to 'assure' people the wisdom of managerial decisions."

• **Permanent head senior certification.** The function of certificates should as-

sume a discretionary function with CAB, Murray argued, in opposing the McCarran proposal for permanent certificates for local airline airlines.

Comments: Departmental acquisition of new aircraft is a "demand" rather than giving all carriers the degree of stability provided by permanent certificates wherever justified and at the earliest date possible.

However, we believe that this should be accomplished within the CAB's existing authority to determine the appropriate duration of an issue consistent on the basis of evidence specifically relating to its particular service.

• **CAB control of international rates.** Proposed in the McCarran bill and recommended in the ACC report, was supported by the Undersecretary. • **Federal jurisdiction over safety program** was endorsed by Murray, who commented that "even though, in his opinion, does not find itself in adequate safety regulation by different states."

He objected to proposals in the McCarran bill removing from the states a measure of "control of operations in air navigation wholly intrastate in character."

• **Private fleets.** Murray approved proposals for safety regulation of private fleet "in a last-oncome manner that is required for commercial operations." He opposed proposals permitting private firms to do all scheduled work on their own assets "without regard to their fitness to perform such work."

Other witnesses on the McCarran revision:

• **John Allen, Assistant Permanent Counsel,** who urged legislation making it clear that the award of a certificate to transport mail does not carry with it a "right" to subsidy support.

Grant have areas in the past where new carrier service was not made available for mail use simply because of the relationship of a mail certificate to the right to claim subsidy, he testified.

Allen also asked for legislation that would limit mail rates to the "minimum able and necessary cost to the air carrier of performing mail service, plus a fair return." He objected that mail rates set by CAB appear to be too high.

We find... that the average yield per ton-mile to domestic trunkline carriers for freight service is approximately 22 cents, compared to an average yield of approximately 50 cents for the transportation of mail.

"We find also that under certain tariffs the freight rates on certain items, where the handling would appear to be more burdensome to the carrier than the handling of a sack of mail, are lower than the charge made to the post office. For example, for express items that have not been outlasted, the charge between New York and Los Angeles is

approximately 17 cents per ton-mile."

• **Roger Lewis, Assistant Secretary of the Air Force,** who spoke for the Department of Defense, declared that it is made clear in legislation that regulate and as carrier contract, as well as scheduled airlines, new public charter and special services for the military service.

• **William Wright, representing the Solicitor, Department of Labor,** urged that a provision be worked into legislation

law providing "that no airline shall-by sales, contract or otherwise-lose in any way its liability for personal injury or death of its passengers and that any attempt at such limitation shall be void and of no effect."

He reported that the government has paid compensation for injury totaling more than \$1.5 billion to the dependents of 20 inland employees who have been killed or injured in airline crashes over the past five years.

Masses of the heavy bombers that flew over Mexico on May Day this year.

We shall be fortunate if anything bigger than war in Indo-China makes us that Administration the verdict that war in Korea won't on the Laos-Japan administration.

• **Chalmers Johnson,** who has challenged the Administration's anti-power program. He declared "Today, when the Soviet Union possesses more advanced mass first-class jets than the United States and its combined allies, when its best planes have proven in Korea to be the equal, if not superior, of our fighters at normal combat altitudes, when it possesses long-range bombers with which to home developments, when its nuclear arsenal is more important of all, when it possesses the atomic and hydrogen bombs capable of leveling the cities and industrial might of our nation, it is unthinkable that we should be content to let our enemies obtain the strength of the ocean and its ports in their own development."

"Provisional arrangements in our own national defense are not comparable to requirements in the civilian's capacity to penetrate that defense."

Boeing Sets 707's First Flight for July

Boeing Airplane Co.'s 707 jet transport prototype will make its first flight soon after July 1, the company says.

Receipt of damage suffered by the craft during test trials at Renton Airport, Wash., May 21 will end preliminary testing May 24, p. 115.

The company is testing a landing gear attachment system because of similarities found in previous tests of the aircraft in the region for the wings described as "minor" by Boeing. The particular attachment involved is being redesigned. Microsoft 1. Power, direct project engineers-on-site, reports.

He says as primary wing in landing structure was affected and none of the 1,000 lb. of fuel aboard was spilled. No fuel leaks have been noticed, and the engine pod virtually was undamaged.

• **W. W. Waring, A. M. (Tex) Johnston,** Boeing chief of flight test, reports "We were testing at low speed when the plane's attitude changed. We immediately cut the engines although we didn't know what had happened."

Johnston says the 707's acceleration was "fairly good" and a landing start to high speed is acceptable. He says it's 38.

He also praises the 707's strength, brake effectiveness and visibility. The gear response, with the brake mechanical controls, is "very good," he adds.

Airpower Policy

Reminders of discontent with the Administration's airpower program continue on Capitol Hill.

A top Republican, Sen. Alexander Wiley, has joined in the disputation that the "new look" program is adequate to view developments in the Asia theater. Wiley, chairman of the Senate Foreign Relations Committee, declared in a major foreign policy address.

"I have doubts as to the adequacy of the defense establishment under the new commitment in which we find ourselves."

"I doubt that we can be strong not seeing our Air Force when, from the latest Soviet air parade, we learned that they now apparently not only have the equivalent of our B-49 bombers, but the equivalent of our B-72 aircraft-bombardier jet bomber as well."

Wiley also was skeptical of the "new look's" three-domain doctrine in Army strength (which, entitled a setback in both wings, "in the very near future when our responsibilities are increasing, rather than decreasing, throughout the world."

• **No increase-A. dissonance on the new look's** program will come when the Senate, at the next session, takes up the appropriation request to finance the program in fiscal 1973. Senate Appropriations Military Subcommittee has completed hearings on the measure.

Sen. Homer Ferguson, subcommittee chairman, felt his dissonance any possibility that the Administration will seek additional funds to the \$11.2 billion it expects to request for the Air Force. The House reduced this to \$10.6 billion (Aviation Week May 5, p. 18).

"I wish to make it clear on the record that I have no evidence to indicate that there will be an application or evidence presented for a deficiency bill to increase the amount of the present request," Ferguson declared. He qualified, however, that "the military situation... is not as good as it was."

Ferguson's statement was made after Sen. Robert Minkoff, a member of the Military Appropriations Subcommittee, interpreted an additional request to the Administration as a result

Dissent Grows

of recent developments in Indo-China. When the request is made, Wileyback said, "I shall again take up the question of adequate appropriations for the Army and of moving forward the Air Force program at first in those in charge of it can be moved forward."

• **Representative—The Armed Forces** Committee of the House of Representatives, led by Sen. Charles McNair, Tennessee, pointing to Soviet support advances (Aviation Week May 24, p. 141), has had these recommendations on Capitol Hill.

• **McNair** in a recent speech, declared "I support that Gen. Twyman, and others cannot tell the American people what they think about the so-called 'new look,' as proposed by the President, who, after all, is supposed to be in charge."

• **Rep. Charles Eichel** observed "Only a year ago, Secretary of Defense Charles Wilson suggested that the Russian are in place with the remark that it was a sign of their weakness that they were going to place and inferior to our Air Force in airframe support. Some members of Congress, moreover, indicated pictures of Russian heavy bombers that appeared in 'Aviation Week' last February."

"It was not so easy to dismiss reports from our diplomatic representatives as

Last F-106F

Last F-106F to be built by North American Aviation has rolled off the assembly line at NAA's Los Angeles plant, making way for increased production of the F-110 Super Sabre.

The company still is producing its latest F-106F all-weather interceptor at Los Angeles and F-110 fighter-bombers at the Goleta, Calif., plant.

North American manufacturing manager Jack H. Ridd said the F-106F jet fighter-bomber cost less a unit than per pound during two years of production than the simpler, supersonic-driven F-105 in World War II.



Kaman Tests Twin-Turbine Copter

Fast photos of Kaman BTIC-1 twin-turbine copter fitted with two side-by-side Boeing 1600 turbos, a pilot from Navy report that flew for the first time last Jan. 26. The two engines, detailed in cherry, produce 280 total hp, compared with the 240

hp delivered by the single T-400 engine. 6-015 push upon normally powering the BTIC-1 on multi-engine flight. The Boeing engine does not exceed that of the T-400. The BTIC-1 can be flown with the turbos open using turbochargers or on either engine

Military Boosts Jet Fuel Demands

Defense estimates wartime need at 2 million barrels daily, sets peak price requirement at \$300,000.

A long war fought with superior planes, would require 2 million barrels of jet fuel a day for all aircraft, Defense Department estimates.

Estimates for the United States alone will run to about 240,000 barrels a day in fuel 1956 as some jet aircraft are added to the armed forces.

► **Miles Problem**—Figures disclosed by USAF Col. J. E. Rouslin before the American Petroleum Institute indicate that the problem of meeting military requirements for jet fuel stands as one of the major jobs facing the oil industry in the next few years.

The demand for aviation gasoline, Rouslin says, is expected to increase through 1955 or 1956 and then start a gradual decline in reconverting engines now in use. However, U.S. civilian and foreign requirements for gasoline are estimated by the Petroleum Administration for Defense to increase continuously, affecting the cut in U.S. aviation fuels.

► **Jet Fuel Use**—Forecasting that U.S. military planes will need a peak of 131,000 barrels a day of aviation gasoline in 1955 or 1956 and then reduce the demand to less than 95,000 barrels a day in 1962, Rouslin says.

The primary reason he believes the future U.S. aviation aviation gasoline requirements will be so high is that we are still purchasing and will continue to buy large transport and support-type aircraft which are large consumers of high aviation aviation gasoline.

"For example, that the transport-type aircraft are now consuming 45% of all aviation gasoline in the military. In fuel 1955 we estimate that the transport-type aircraft alone will consume 60% of all aviation gasoline in the industry."

► **Rapid Increase**—Emphasizing the importance of planning to meet large jet fuel requirements, Rouslin states that at the end of World War II, the requirement for this type of fuel was only about 170,000 barrels a day for use in commercial aircraft.

In fiscal 1949 this climbed to 31,000 barrels a day and to 51,000 barrels by 1953, an increase of 600% in three years.

"U.S. military jet fuel requirements," Rouslin says, "are expected to continue this rapid ascent to about 240,000 barrels per day in fiscal 1956 as a result of 200% over fiscal year 1955 or 2,000% over fiscal year 1948."

"It is expected to level off at about

210,000 to 300,000 barrels per day if the situation doesn't change materially."

Foreign jet requirements are about 50,000 barrels per day and can be expected to increase to about 125,000 barrels per day by 1950. This will bring total worldwide jet requirements from a current 300,000 barrels per day to at least 400,000 barrels per day by 1960.

► **Industry Problem**—Those jet engines, Rouslin says, pose a fuel problem of new magnitude for the petroleum industry. He reports that planes with reconverting engines are anywhere from five to 1,000 gallons of gasoline an hour, but jet powerplants run up this rate to 400 to 2,500 gallons an hour.

"One of our largest fuel jet aircraft, he says, "will consume in one hour the same quantity of petroleum which is consumed by the average automobile in three years."

► **Jet War North**—In case of war, Rouslin says, worldwide aviation gasoline requirements, including fuel for civilian planes, are estimated to double present consumption, putting the demand "in the neighborhood" at 500,000 barrels a day.

"On the other hand," he continues, "worldwide requirements of jet fuel will be about 400,000 barrels per day at the beginning of the war and will increase to 3,500,000 barrels per day if

the war continues for any length of time."

"If and when we start using superior jet aircraft, the figures are even more startling. We realize that the requirements under these conditions might easily be 600,000 barrels per day for a long period of conflict."

He says his figures are not based on any known war plan, but are the estimates used by Defense Department.

Other facts on aviation fuel discussed by Rouslin:

► **Big future need** in synthetic oil for lubricating jet engines. Only one company in the last met jet specifications. Other producers are sought for synthetic oil purposes.

► **Decline Department** will spend \$600 million to fund 1954 for aviation fuel, 50% of all the money paid for petroleum products.

► **Estimates** for fiscal 1955 are that these figures will climb to \$650 million.

► **USAF** is expected to spend 30% and the Navy 20% of the total for aviation fuel in fiscal 1955.

► **From fiscal 1954 to 1955**, USAF's requirements for jet fuel will climb more than 50%. Navy need will grow about 10%.

► **Department of Defense** jet fuel requirements for fiscal 1955 will be 78 million barrels, down from the 83 million barrels in an earlier estimate.

Board Sets Cause In AA 240 Crash

Probable cause of American Airlines Constair 240 crash near Buffalo, N. Y., Jan. 20 is attributed by Civil Aeronautics Board to

Mechanical failure of the frequency-hunter pump that continuously feathered the left poppet valve assembly, after becoming airborne.

One of an incorrect procedure for unbolting that resulted from the "mishaps" of the contractor for installation, "contained in AA's manual."

The aircraft made a wheel-up forced landing in a specially wooded field on the south of Buffalo Airport shortly after take-off on Atlantic City-Lancaster flight. Crew and several of the 21 passengers were injured but none fatally.

Board investigators found that immediately after take-off the left poppet valve assembly feathered due to fatigue failure of the transverse to base pump. When the pump attempted to return the left engine, CAA reports, "it is indicated that he held the feathering button to the feathering position longer than two seconds."

"It is very probable that had the use of unbolting procedure been used at that time, the engine was capable of returning and would have done so," the Board says.



FREDON STRICKER, CARBIDE, Birmingham, captain evacuated about 50 seconds before



HO HOSPITAL at Newport, R. I. How a P-51 Mustang B-1F is involved near the facility.

Copters Save Bennington Injured

Four helicopters, operating a shuttle between the carrier Bennington and Newport (R. I.) Naval Hospital, evacuated about 30 seriously injured men from the ship after it was struck by explosives 71 mi off the coast of New England.

Rescue consisted of two Sikorski HO4Ds from the Coast Guard Air Base station at Salem, Mass., and two P-51 Mustang B-1Fs from the Naval Air Station at South Weymouth, Mass.

The explosion occurred about 6:30 a.m. and the carrier was seriously damaged by the Naval Air Station at Quonset Point, R. I. At about 10 a.m., the helicopters started their shuttle and continued operations until 17:30.

► **Skinner Praised**—Very experienced crew of the helicopters, with flying the loss of some men who would have died if not removed promptly to the hospital.

The captain landed at Newport on a vessel jet adjacent to the hospital.

Because of the Bennington's slipper, Capt. William F. Roberts, no serious landing accident after the explosion was high-point from his fellow officers. About 20 jet fighters were in the air when the blast took place.

Without knowing the extent of the damage, Roberts ordered flight deck operations to continue and the planes dispatched to Quonset and other Naval Air Stations.

Captain Roberts was able to clear the ship of 40 pilots and more than 515 million worth of planes.

Turboprop Beats Jet For Airlines Bristol

(McGraw-Hill World News)

London—The turboprop in the engine has rated for commercial airlines and the parent test itself, says Bristol Aeroplane Co.'s director and chief engineer, Dr. A. E. Russell.

Russell says the turboprop is promising a substantial percentage of all airline transports. He believes that "when the excitement of a new form of propulsion has faded," the turboprop's greater potential capacity for safety will be realized.

For any given duty the turboprop will be smaller, lighter, more economical and versatile than any other kind of engine, Russell says.

B-58 Program

- New bomber scheduled for test flights in '57.
- AF asks \$99 million in pre-production funds.

Comer's supervisor Hunter (Army) was May 24, p. 131, the B-58 delta wing bomber, is expected to reach the flight test stage during 1957, according to Air Force testimony before Congress.

The USAF fiscal 1957 budget report outlines an item of \$99 million in pre-production funds to speed the manufacturing phase of "a new aircraft, a new engine, and four major electronic component sub-systems."

The aircraft is understood to be the B-58, the engine General Electric's 179 turbojet, and the electronic components are the bombing and navigation system, autopilot and control system for the B-58's production.

► **Accelerated Production**—USAF budget officials and the \$99 million will be spent on the following activities to accelerate the production phase of this specific aircraft and its major sub-systems:

- Conversion of experimental designs to production drawings
- Necessary survey and studies concerning appropriate tools and testing equipment
- Designing and constructing "limited quantities" of parts, tests, fixtures and other production facilities and aids to be used by both the prime contractor and major subcontractors
- Procurement of long-lead-time components for a limited number of early production units.

"By applying preproduction funds," USAF explained, "it is possible to introduce new aircraft and equipment a year or more earlier than would otherwise be possible. This is done without contractually obligating the government to a definite projected production program."

"Specially, small quantities of these new items can be produced at substantially lower costs when built with production tooling, rather than handmaking the initial models. There is also the advantage of prototype models being ready to substantiate production models."

Regarding the Air Force's fiscal 1955 production budget, the Air Force Budget Committee's G. C. Gandy told Congressmen, "We are awaiting funds for actual production engineering, the tools, dies and fixtures for a new aircraft that will be suitable for flight sometime during 1957."



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MECHANISM UNCOVERED, showing down (foreground) and the chute storage cylinder.

New Braking Chute Is Retractable

London—An automatically retractable braking chute for jet aircraft that can be used hundreds of times without requiring repair, according to the designer, has been tested in that country.

C. Q. Peachtree Co., Ltd., Woking, Surrey, demonstrated its new device atop a racing car that was driven up and down a runway at more than 100 mph.

► Mechanisms—One or more chutes are

stowed in a breeching holder, the rear part of which telescopes over the forward section when the canopy is ejected by a spring-loaded piston.

Once the pilot pushes the release button, the action is automatic. The chute extends, slows the aircraft and, when air pressure on the chute is eased, a switch is actuated causing an electrically operated drum to wind in the canopy.

Asphalt Wins House Nod in Runway Fight

Air Force has been directed to use asphalt on all "noncritical" areas of airfields by the House Armed Services Committee, Subcommittee, which conducted hearings on the relative merits of asphalt and concrete.

USAF had protested on concrete (Aviation Week Mar 5, p. 22).

The subcommittee's numerous decisions indicate that asphalt has a definite place in the airfield program and is suitable for areas large noncritical areas on airfields.

Greater use of asphalt in the projected program of USAF, which estimates that—William H. Hines estimates, would result in a saving of \$50 million. "I hope that on technology that concrete pavement costs approximately 1.5 times as much as asphalt," he says.

Hines adds: "Of course, we have found that there are some places called 'critical areas' where only concrete will serve the purpose. I hope the Air Force does not take advantage of that finding to equal 'critical areas' so that they cover the whole field. There are large areas on a field which are used only a small portion of the time by airplanes taking off and landing. No crash prevention is required for that purpose."

"In my opinion, this is the time to take greater action for the burden on our taxpayers. Fifty-million dollars—saved on the ground—would buy a lot of planes. Fifty million dollars, obviously, will do more good in the air than on the ground. We want a great Air Force in the air."

Kawasaki to Build AF Jet Overhaul Facility

For East Air Ties Logistics Force, has awarded Kawasaki Aircraft Co., Ltd., a contract to establish a facility to overhaul U. S. jet engines used by USAF in Japan.

The jet engine program is one of many projects being carried on by the U. S. government to facilitate military operations and to assist in the economic recovery of Japan.

Lockheed Aircraft Service Overseas, Inc., and Kawasaki negotiated a contract several weeks ago whereby the U. S. company would furnish technical assistance to Kawasaki in the overhaul of jet engines and auxiliary and at the manufacture of certain Lockheed designed aircraft and jet engines used by the Air Force (Aviation Week Mar 5 p. 7).

The contract has been renewed by the U. S. government and will be up for consideration by the Japanese government shortly.

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ARMA ADVANCED ELECTRONICS FOR CONTROL



House Unit Probes Airmail Experiment

The House Post Office Investigating Subcommittee is focusing attention on the use of moving all first-class mail by air because of the experiment's impact on the transportation industry.

Rep. Kefauver (D-Conn.) scheme, which is being studied, says, "The effect of the current experiment in transporting first-class mail by air in a space suitable bus is reflected throughout the entire transportation field. . . . The experiment has caused great losses in the part of railroads, which face a wholesale diversion of business and from rail to air transportation."

"The regularly scheduled airlines, now participating in the experiment, have expressed in the program. Local service air carriers wish to be brought within the experiment in order to demonstrate their ability to transport such mail in great volume at reduced cost."

"The effect of this experiment on the industry has apparently been peaceful. It most successfully averts close attention."

Industry View—American Trucking Assn. is well as other associations support the shift of first-class mail to air. Highlights of statements to the subcommittee by different segments of the industry.

• **American of American Railroads.**

"The railroads doubt that there are many instances where general surface mail can be carried quicker and cheaper by air, bus, or truck than by rail. They are concerned by recent actions and publicity in the field that indicated volume of surface mail will or might soon be diverted from railroads to motor and air carriers. . . . There is grave doubt as to whether railroads can move forward in the face of threats of wholesale diversion, with program capital expenditures for improvement of railroad service for mail."

• **Air Transport Assn.** advocates the transport of all first-class mail by air when delivery would be expedited, "would decrease the total operating revenues of the railroads by less than one-quarter of 1%."

• **American Trucking Assn.** recommends that "all non-local first-class mail be transported by air whenever this would advance delivery."

• **Air Coach Transport Assn.** declares that "most of the mail now being transported by surface can be more efficiently and economically transported by non-scheduled airlines" and urges legislation to permit bulk shipments by non-scheduled, "advance and direct from the service now being rendered by the scheduled airlines."

• **Independent Military Air Transport**



GEAR AND FLAPS DOWN, snaking back toward the runway, Gannet has an Armstrong Siddeley Double Marston tailprop engine. First photo is being delivered to the British Navy's Fleet Air Arm.

Royal Navy Gets Anti-Sub Gannet



DOUBLE-SONE WING FOLD is highlighted as Gannet runs up one end of its dual propeller. Front four-blade control Kato propeller is turning, one unit is feathered. Props are free wheels rotating in Gannet concept, as distinct from geared method.



INVERTED GULL WINGS are another Gannet design feature, to use the plane's large flaps. This pilot is running both units of Double Marston engine. Production plan allows Gannet-developed "envelope jiggling" method. (Aviation Week Jan 18, 1950, p. 27)

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(AN 5000-5A or 71A)
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MODEL 476, 1½" case to ANO 15003
—50 to +300°C Cylinder Temp.
0 to +1000°C Exhaust Temp.

MODEL 776 dual, 2½" case to ANO 15041
—50 to +300°C Cylinder Temp.
(AN 5000-5A or 71A)
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MODEL 476



MODEL 776

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—50 to +150°C Air Temp.

MODEL 776 dual, 2½" case to ANO 15040
—20 to +150°C Air 5700-6 or AN 57020
+25 to +125°F Oil Temp. ...
—150 to +150°C Cylinder Temp.



MODEL 476



MODEL 776

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Acad. complains that "traffic arrangements are made for movement of first class mail on a plane but both the Post Office Department will have failed in determining how and in what manner greater economy and efficiency can be achieved."

• **Civil Aeronautics Board** supports the utilization of local service lines in shipment of surface mail.

• **National Postal Transport Assn.**, representing 30,000 postal workers, opposes "grave doubts as to the wisdom of transporting first-class mail by air except in emergencies." Objection to the curtailment of air mail distribution of mail on weekends, the association contends that "the direct expense, which further curtails distribution in transit, tends to negate the benefits."

CAA Reports Navaid Growth in 15 Nations

Substantial progress in standardization of living aids is being made in many countries throughout the free world, thus Civil Aeronautics Administration of foreign report after a recent tour of 15 countries.

"Best example of progress these days is the growing number of VORs which are appearing in world airways," says Frank G. Stone, administrator of CAA's International Region.

• **VOR Standard**—"This is the short range navigational aid adopted by the International Civil Aviation Organization in standard, and it is the aid with which most of our 70,000 mi. of U. S. airways now are equipped," CAA's international chief says.

"In Europe, North Africa and West Asia, there are now 35 VORs making errors in operation or in various stages of installation, and the program for the next fiscal year calls for some 10 more."

Stone was accompanied by Kirby L. Bennett, CAA communications and radio specialist, and George S. Mason, chief of CAA's Scheduling Operations Bureau.

• **No Big Pushback**—Major progress has been made in communications, according to Bennett, although standardization of equipment and methods is not as pronounced in this field.

"Because the United States is stilling almost completely to very high the capacity radio communications for its ground operations, both the very high and the high frequency systems are in operation abroad," he says.

"U. S. communications centers, however, are equipped to use either, so no major problem exists. Fast and dependable communications on the ground between major traffic points now is the principal problem to be solved."



Illustration: C. D. Goodyear Aircraft Corporation, Akron 15, Ohio



BONNETS FOR "BEES"

These are very special bonnets for very special "bees"—B-47 Air Force jet bombers.

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It was the first to design and fabricate an enclosure incorporating unidirectional glass fabric and synthetic fibers in the edge attachment.

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● (3) New Navy Interceptor



● (4) Powerful jet engine with afterburner

WHO'S WHO in aviation progress...

CAN YOU IDENTIFY THEM?

Performance made the aircraft in panels 1 and 2 noteworthy in their day. The famous French Nieuport Scout (panel 1) was a truly, highly maneuverable fighter of World War I days. The bulky Curtiss Wright Condor (panel 2) with its two 780 h.p. engines, could pull a heavy load through the skies. Its panels 3 and 4 are two modern performers... the Douglas F-4D Skyhawk interceptor and the famous Whittlehouse J-46 engine with afterburner. Blades for the J-46 were manufactured by a technique with an outstanding record in the manufacturing field... the Microcast process of precision investment casting.

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Maintenance Training Lags, Survey Shows

A survey of 22 of the largest civilian airlines reveals that only seven are training apprentices in maintenance and some Department of Labor experts.

Labor's Bureau of Apprenticeship during 1953 conducted a campaign to encourage development of additional training for maintenance personnel in the air transport industry. Twelve additional civilian airlines now are considering establishing apprentice training programs.

Most of the carriers provide short-term training in specialized aspects of maintenance and repair, Labor says.

► **Employment Gains**—The department points out that employment in air transport has increased 10 fold in the last 20 years. Airlines employed 194,000 persons in January 1954, compared with 10,000 in 1934.

"As a result of the continuing expansion of air transportation, coupled with increasing complexity of planes and equipment," Labor reports, "there will be an increasing need for aircraft mechanics and other trained maintenance personnel."

"Such workers now comprise roughly one-third of all aircraft employees. Mainly, a considerable number of aircraft mechanics are employed to service aircraft operated by business organizations for their own use and also to maintain the planes that are used for federal, state, county, city, and other governmental service."

"Aircraft and engine mechanics have

been in short supply for several years and this tends to lead to the Department of Labor's list of critical occupations."

► **Advantage-Labor** cites these advantages of an apprentice training program. One of the latter argues with a long time apprenticeship program points out that the value of this type of training is becoming increasingly apparent. A high proportion of the mechanics currently employed by the carriers are products of their own apprenticeship programs.

"Moreover, the all-around training provided during apprenticeship has proved to be very helpful in the development of supervisory personnel. Most of the key officials in the carrier's main business department are former apprentices."

Bunker Buys Block Of Martin Common

Biggest stock transactions recorded during March within the aviation industry by the acquisition by George N. Bunker, head chairman, and president of Citicorp, of Martin Co., of 217,855 Martin common stock shares through the Wieders Co. Securities & Exchange Commission reports.

Bunker holds 1,800 common shares personally and 217,155 shares through the Wieders Co. John L. Sullivan, director, bought 2,800 common shares, bringing his total to 1,000. J. B. Wharton, Jr. officer, bought 1,800 common shares, his total common holdings.

Other stock transactions included:

American Airlines: P. D. Latta, officer,



Air-India International Gets Super Connie

Here is the list of Air India International's Lockheed Super Constellation en route to India with a shipment scheduled to be loaded there, where a special gift will be made.

The plane will go into service on the Bombay-Colombo-London route, carrying 99.51 feet-long passengers. Air India recently increased its Wright Turbo Compressor-driven Super Constellation from two to five planes. In addition to the U.K.

version, the planes may be used on new routes. A strong main indicator that the airline will extend the North route to West Africa, South America and the U. S. Look look reports. The new Super Constellation will supplement four Constellation now flying on the airline's long-range routes. There may be transport to India Japan and India Korea service, according to the transport executives, including further expansion.

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 1/2 tsp baking soda: 1/2 tsp / 1/2 tsp
 add 400 grams of flour, 1/2 tsp salt

Reader Service Dept.- Marlene F. Freeman offers World 110 column, *Chapman Kn 1944-1945*, C. S. Marling has *Shooting and 21st century*, others hold through the C. S. Marling Foundation, *Marling* (see 110000).

Shoring Airplane Co. WITHIN 30 DAYS provided adjusted as compensation for damages there bringing his total to \$440. Defendant's final offer remained as compensation for various other matters his total \$94.

Capital Airlines: James W. Avella officer bought 1,100 common shares making his total 15,000. Thomas D. Westlake Jr., director bought 700 common shares bringing his total to 1,100.

Unsettled Ties already Corp., Edmund Faria, editor and his common share, his total holdings: John Faria, director acquired through Lehman Bros. Total common shares making his total 1,000.

Carlson Welding Corp. • William T. Lohr
owner bought the common stock outright
at a cost of \$100

Eastern My Kasea **Reynolds** **Penfold**
2+ diameter with 400 common, leaves bear-
ing 100-150. Laurence E. Reynolds
diameter 100-150 common, leaves bear-
ing 100-150.

Preferred Dividends: \$1.00 per share
 100,000 shares of common stock outstanding
 100,000 shares of preferred stock outstanding

George and **Harriet** P. **Moore**, **Director** **South** **765** **common** **shares**, **his** **total** **com** **mon** **23,100** **common** **shares** **owned**, **his** **400,000** **common** **total** **and** **transferred** **4,000** **preferred** **shares** **held** **through** **a** **trust** **as** **past** **payment** **for** **real** **estate**, **a** **10%** **holding** **for** **real** **estate** **40,000** **common** **shares**, **Charles** **Lebanus** **director** **owned** **3,000** **common** **shares**, **his** **total** **common** **shares**.

Lockwood Aircraft Corp., E. Y. Thompson, officer, bought 4th capital stock making his bid \$1,111. C. W. Winkler, officer, bought 1,000 capital shares.

Charles J. Cohen, 44, is president of the company. He is also president of the American Association of Economic Consultants. Cohen is a member of the American Economic Association and the American Statistical Association. He is also a member of the American Council on Education and the American Council on the Arts. Cohen is a member of the American Council on the Administration of Justice and the American Council on the Administration of Justice. He is also a member of the American Council on the Administration of Justice and the American Council on the Administration of Justice.

North American Arctium Seed: Jumbo
SE, 80 seed larger than *A. lappaceum* brought
in by Russian trader captured late total 6

Northwest Airlines Inc., Wheeling, W. Va., is the largest airline in the U.S. with 117,000 employees. Northwest Airlines Inc. is a public company. Northwest Airlines Inc. is a public company. Northwest Airlines Inc. is a public company.

From American World Airways: American is planning to buy 400,000 common shares leaving 100% of the stock.

Section 8 and Western Airlines Inc. Carl
@ 1988, 1989, and 2000, Western Airlines
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Inc. is a registered trademark of Western
Airlines Inc. All other trademarks are the
property of their respective owners.

Salas-Nieves Es.: Sweet W. Garden. Observed: estimated 500 seedlings. (Sweet, N.)

United Air Lines: H. F. Adams, officer, held 200 common shares, his total holdings.

United Aircraft Corp. - Freshbrook D. Dillworth, officer bought 3,112 common shares for \$100,000.

According to Deal, in 1972, Charles F. McChesney, officer, bought 1,000 common shares making his total 2,500. Joseph P. Pitting, director, bought 500 common shares bringing his total to 1,000 and William B. McChesney, officer, bought 500.

Partidos, 1980s. Height 4000 meters
 10/2/00 10/2/00 10/2/00 10/2/00

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152



OMNIMETER

This is the new last flow line used designed for pilots who prefer to "fly the window" to see cockpit instruments. It resembles the last right window model, but is more comfortable with a 300° view instead. A prototype is scheduled throughout 1991 to all the students of accuracy and suggestions for improvement in design and construction of cockpit views.



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(*Spilostoma peruvianum*?)
Produced by thousands of plants because it is entirely self-seeding.
"The Last Goodbye" greets
Wax," says Douglas Collins,
owner of AIR FORTS. "It was not
at the world jugging. It tells
you your leaving. You don't think
you feel bad in the garden and
all the new-found interest."

LETTERS

GCA Vet Speaks

Being one of the oldest GCA men still active in an active unit, I represented you before up the Reg. First GCA unit at your Lubbock station May 13. I have taught GCA, via both an airplane and down some field experimental work on it.

Brother Pooley's statement was all wet. The GCA course at Keesler AFB, Miss., a 12 weeks long, and the operator usually goes through the Control Tower Operator's Course and the Air Traffic Control Operator's Course before even entering GCA school.

As far as the 100-degree turn, I have no idea whether or not that is the norm. The turn was given, but usually of lesser size. I have a story to tell you "While a 730 degree turn to the right for left is identification," and I am quite confident of the fact that there are only 180 degrees in a circle.

Quite often we have an aircraft turn, for example, right from 100 degrees to 180 degrees. We do this because we know that most pilots will normally turn to the left to meet at the northward heading, so we can easily assume that the "dog" which makes the second turn, is the one we are discussing.

Mr. Pooley mentions watching pilots talk.



You can't fly that one by the "seat of your pants"

The skill of a World War II pilot's flying was mostly an intuitive feel of the plane. Nowadays, instrument speeds, light formations, and hazardous night flying require more than flying by the seat of your pants.

Pilots must depend on a vast array of instruments and precise electronic and hydraulic equipment. Today's flying gets their trust in equipment they know is the most reliable in the world.



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ing GCA badging when colleges were as low as 100 ft. He ought to check his Radio Pooley Cheat and he would find that most Air Force bases have a minimum of 200 ft. There is no lower control about that.

Back in 1945, when I left got into GCA, there were no printed manuals. We used to bring the dog right into the deck, and we have some pretty slight variations after he has the dog, which is no real still in the ball of the game. Check some of the old Army Air Force manuals on GCA, and the old GCA manual at Ft. Benning Air Force Base (now USAF AFB, N. J.) the last of 1944 and the first of 1945.

Then we the red right on the hand when we received the USAF GCA hand. Look for the same situation in the case of Tampa, by coincidence, when we left the position of the radio second Tampa Manacoll and MacDuff AFB. As usual, GCA doesn't believe radar traffic control is here to stay, except for monitoring ILS (right).

By the way, the hand number (1) nature to run the most experienced need in the logical area is put the situation where you go to the 100. That would indicate to me first the man who was going the "wrong" way a lot more qualified for job than Mr. Pooley, is to judge what is a good or bad "man".

For obvious reason I wouldn't care to be quoted by name on any of the foregoing—unless the USAF might not appreciate me doing so. I will admit I am a little better about the way GCA, as a whole, has handled this radio or traffic control problem. There have been some good jobs. We are starting that more now in the Air Force. We can handle a radio better and with less confusion thanks to radio, and I like the fact that we are finally going old "old control" and radio it when they typically look nothing about it.

S. F. USAF

(The name is name is omitted by Area 7000 Waco, as he requests)—Ed

Tribute to Gen. Van

For many years I have been a fervent reader and admirer of your publications, but never have been the time to circulate your and your staff on the excellence of your efforts with Aviation Week. However, at this time I am writing you for a favor, and at the same time want to compliment you on your good work.

The issue really isn't such, but merely I request that you give your best regard of the photograph that is on page 16 of



Announcing

Bendix-Pacific NON-INTERFLOW HYDRAULIC ROTARY PLATE VALVES



The new Bendix-Pacific Rotary Valves combine three outstanding features that give them superior performance for all directional valve applications:

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The Valves incorporate an internally true hardened steel piston, controlled by an exclusive Bendix development, which positively isolates the fluid flow.
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- LOW OPERATING TORQUE**
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your Apr. 12 issue. That picture had more punch than 25 editorial concerning the fight for progress. I knew General Voss at all so must have one way or the other, and would receive a copy of the photograph, if you could make one available.

By second post card you will be appreciated.

THOMAS F. STARR, National Director
Air Force Association
1424 E. St., N.W.
Washington 5, D.C.

Air Revolution

Captain Rutenfranz's prediction that latest class of attack aircraft is certain to replace the so-called first-class model is a pre-

dictor of the future for the future, as you said in your editorial on May 16, one would have seen the future of the future.

These are, however, approximately 70 or 80 different operators to whom their views are not quite that new or startling. The operators of aircraft are not quite that new or startling. The operators of aircraft are not quite that new or startling. The operators of aircraft are not quite that new or startling.

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Support for Soaring

We were very pleased to see the editorial in *Aerospace Week*, May 5, 1954, "We Can't Afford a Soaring Team," and I am quite sure that it will be a big help in setting back the International Team. We will keep you informed as the matter we have with this team, as well as in our private details once the team is a new thing.

PAUL A. SCORVETTA, Secretary
Soaring Society of America
Elmwood, N.Y.

Keeping Engineers

We appreciate the comments to repeat the article in "New to City and Field Your Engineers" taken from the Feb. 1, 1954 issue of *Aerospace Week* (p. 11).

C. E. RUSSELL, Manager
Technical Information Branch
AEC, Inc.
Tulhatch, Tenn.

Tube Reliability

I would like to express my appreciation for the article reprinted from *Aerospace Week*, May 12, 1954, "Tube Reliability" (p. 14).

A number of requests for copies of the original paper have been received. All of them referring to *Aerospace Week* I feel sure that this article has certainly contributed to a deeper understanding of the problem of reliable tubes for guided missiles.

K. R. LARSEN
Kelsley Design Group
Clemson University, Clemson, S.C.

Praise

We are all very pleased with the way David Anderson's article on Air America was written and presented in the May 30 *Aerospace Week*. It is a splendid job as a well-written, concise and accurate report on the situation.

CHARLES W. WICKST, President
All American Engineering Co.
San Jose, Calif.

[This writer ordered 1,000 reprints of the article—Ed.]

Who designed and built the Afterburner Temperature Control for the record-breaking Douglas F4D Skyray?



The Afterburner Temperature Control on the Westinghouse J 40 turbojet which powered the history-making

U.S. Navy's Skyray is a development of the Aircraft Products Division of Manning, Maxwell & Moore, Inc.

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NEWS NOTES

NEW LOWER COST FLOATS ANNOUNCED



Good news for charter operators and airplane owners comes from Edo. For aircraft in the Cessna 180 class (2500-2700 pounds gross weight), a new float with improved performance and increased buoyancy has been developed and is now on the market.

Known as model 2870 (2870-pound displacement per float), the new floats replace model 2435. They have new, specially carved bow sections and greatly improved rubber bow bumpers, easily removed. They retain the famed Edo dual-horned for maximum performance. Badder control is also greatly improved.

Despite these improvements and increased displacement, the 2870's are priced at \$1,395—\$1,695 less than last year's price on the 2427's.

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KEYLARK 10X.1 slides out of short fold with high lift flap and clasp extended. Note some balance on all outside slants.

Skylark Designed for Vertical Flight

Robertson aircraft combines unconventional ideas to get unusual performance; Army to pay for certification tests.

By David A. Anderson

The sleek but unconventional lines of the Robertson-Slyter SRX-1 hide a collection of unconventional ideas which the designers believe will give vertical-flight performance to a fixed-wing airplane.

- **The Xeon:** A high lift wing using a combination of flap and slat to produce a flight-tested maximum lift coefficient above five, an unusual control system independent of relative forward speed, a different application of gas turbines for manoeuvre.

- The designers: Springfield of Robertson Development Corp., a 77 yr old, former Robertson, son of the late W. B. Robertson who designed the famed Monocoupe of the late '20s. Associated with him is a young and enthusiastic group of part-time engineers and technicians who designed and built the prototype. *Continued*

• The planes—Skolch SRX-1—is a free-flying prototype, built as a flying testbed for the aerodynamic principles in the design. It has completed about 58 hrs of flight time. Next step is certification tests, and after that, Robertson plans limited production of a pair of airplanes based on the SRX-1 and powered by reciprocating engines. Ultimate goal of the program is a turbo-

prop-powered plane capable of taking off and landing at zero distance.

Contributions will be paid for by Army Transportation Corps under a unique agreement just negotiated with Robertson. Army purchases flight time on the Skylark prototype, thus getting necessary test data for evaluation.

► **Performance**—The prototype Skylark is powered by a 120-hp Continental engine. With a maximal useful load of 1,250 lb., the plane has established these performance marks, used as the basis for the company's performance guarantees:

- Takeoff and landing distance, 100 ft; takeoff over a 50-ft obstacle, 150 ft; landing distance over a 50-ft obstacle, 100 ft
- Cruise speed at 18,000 ft, 150 mph

- Cruise speed at 14,000 ft. and 75% power, 178 mph
- Maximum speed, level flight, 163 mph

* Maximum speed, level flight, power on, 74 mph.

- Power of 10 coefficient, 50 plus
- Theme: World Medications, WHO, etc.

level of test data to build on, Robertson has planned three production airplanes to follow in logical succession. Sharing a basic airframe, the three differ in details of wing area and propulsion system.

- Model 387N is the basic production

model powered by a 360-hp reciprocating engine. Landing gear is fixed, and wing area is 140 sq ft. Normal gross weight is 3,500 lb. Chief design consideration was short-field performance.

• **Model SRC** is the same as SRC, but with half the wing area and retractable landing gear. Chief design consideration was high-speed cruise with reasonable landing and takeoff distances.

• Model SCITC is the subtyping post-card airplane which Robertson believes will be capable of vertical performance. The common airframe has been designed around the propellers system for this airplane. Production of the SCITC will be delayed, the firm says, until the propellers system has been successfully developed.

► **Design Elements**—Robertson says that there are four practical considerations in obtaining vertical flight performance, and that they govern the design of the Skylink project. First, the thrust must exceed the gross weight at the impulse. Second, the design must have a high lift wing capable of using the propeller slipstream velocity. Third, controls have to be independent of the actuator wind. Fourth, the ground attitude angle has to be greater than the hovering attitude.

Solving the thrust problem was

quite vary. Robertson says that the high first-weight price of the gun helped make it the natural choice. But how many engines to cut and where on the circuit to locate them took most study.

The group concluded that paired engines driving counter-rotating coaxial propellers would be the answer. This way, a pair could shut down an engine and cruise on the other at its best specific fuel consumption; in addition, there would be a margin of safety should an engine quit on take-off—that might not be available if the engines were individually mounted outboard on the wings.

Performance estimates using gas turbine power were so outstanding that Robertson decided that the same configuration powered by a reciprocating engine would have excellent performance. This led to the decision to design the turbine for both kinds of powerplants.

► **Powerplant** **Elements**—Continental built Turbomeca Artouste 2 gas turbines are planned for the Skylark SGTTC. A Continental G80-525 re-operating engine, driving a Hartzel 108 in. prop., powers the machine.

Stem length on the prototype has been measured at short intervals per hour.

The unusual feature of the gas turbine preceptor is that it does indeed do its job as an element of the control system. By varying the collective pitch between the distal and proximal distalometer props, a torque is produced on the airframe. This torque—equal to the net difference between the two prop torque-increases in effectiveness as forward speed decreases and reaches a maximum at zero forward speed. This torque supplements the spoiler lateral control system.

There's one other different idea in the postmortem: a declustering system to separate papers from specific dates. In one batch registers fall during final approach, the pilot can descend with the props in annotations and let them windmill to a high spin. Just before touchdown he can throw the props into high pitch and use the inertia of the spinners to give him temporary thrust and control.

► **High-Lift Devices**—Robertson wanted to get maximum effectiveness out of the wing; to do this, the wing must have a large suction velocity by the slipstream. Further, it must be stall-resistant and should develop its high lift coefficients at a relatively low angle of attack.

In addition to all this, the wing has to be as strong as possible so that it does not succumb. That established a set of limits for wing loading, because a wing large enough to have high lift



SKYLARK WING shows tandem spilers extended (top), high-lift flaps and slats in takeoff position (middle) and extended for landing (bottom).

Skylark Performance Characteristics

See Local Standard Conditions
(See 1000)

[illegible]

* This conference scheduled to start on

characteristics alone would be prohibitively expensive. Thus the design path leads to extensive use of high lift devices with a moderate wing area.

Robertson argues that there is really no need for using any more wing area than can be kept in the deployment, because the primary demand for lift is at the initial loading and hovering conditions. He says that a small, heavily loaded wing—what he is thinking of wing loadings around 25 psf when the wing is in the deployment—because the primary demand for lift is at the initial loading and hovering conditions. He says that a small, heavily loaded wing—what he is thinking of wing loadings around 25 psf when the wing is in the deployment—because the primary demand for lift is at the initial loading and hovering conditions.

lift coefficient, normal loading and take-off speeds.

But there is a strong argument for going to a lighter wing loading, something in the order of 15 psf. With this loading, as on the prototype airplane, extremely slow landings and takeoff can be made, and the maximum flight speed gets very low.

The solution: Use two sets of wings to provide two different airplane designs with the same basic design. Robertson has done that, each wing has an identical section and chord so that they are interchangeable on a given fuselage.



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Complete brochures on plant facilities available upon request.

but wing "N" has 240 sq. ft. area and gives a normal wing loading around 14.5 psf, and wing "C" has 120 sq. ft. area and has a 29 psf wing loading.

► **Flip Detail—High lift** on the Robertson wing is accomplished by the RDC flap, designed to be the most effective trailing-edge device which could be produced by current, simple techniques.

The RDC flap combines the Fowler with the double-slotted flap. Retracted, it lies with the wing with almost no increase in drag; extended it is equivalent to a 45°-closed double-slotted Fowler flap deflected through 75 deg.

Such a large flap gives high negative pitching moments when extended and high lift during the extension. To balance this, Robertson developed a slot or shroud with a 30% wing chord. Normally retracted, the shroud extends forward about 20% of the chord and spread aftward to the wing for the Stratoflight's landing and takeoff.

The shroud balances about 80% of the flap pitching moments, so that a normal rate horizontal tail can be used, and the following tail load would not be unduly high, thus making more total lift available for landing. But the shroud also provides three advantages:

- Prevents stall up to 45 deg. angle of attack
- Increases actual lift by increasing the wing area 25%
- Increases lift coefficient by increasing flow velocity over the wing
- Acts as a flap servo to lead back its own forward air loads into the flap extension system through a mechanical linkage. High flap loads are overcome mostly by the shroud loads.

Robertson has shown a flight test momentary lift coefficient of 5.75 based on the original collapsed wing area of the Stratoflight.

► **Control System**—On airplane with an extreme speed range requires an unconventional controls, and the Stratoflight is no exception. Longitudinal and directional controls are all-weather surfaces hinged at the quarter-chord line. Internal control system is a system plus the use of differential gear wheel.

The prototype Stratoflight was built with fixed fin and movable rudder of large chord, but production airplanes will have the all-movable surface. Both surfaces are equipped with air-balancing tabs to give the pilot a "kick" force for foot. Both surfaces have mass balances to prevent high-speed flutter, and tabs also have mass balance.

Robertson says that one of the reasons for the current suspended control characteristics attributed to slight twist of the prototype has been the slipstream. Calculations indicate that the upper third of the theoretical slipstream cylinder was the tail section. If the plane is standing still on the

IT'S ALL A MATTER OF DEGREES!



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Bristol Syncoverter Switches are non-resonant, wide-frequency, low noise-level, precision synchronous inverters or rectifiers, with two SPDT or one SPDT switching action.

A series of models is available, designed for optimum service under various operating conditions involving ambient temperatures of -55° to $+100^{\circ}\text{C}$, and service modulations of vibration and shock up to 500 g's and up to 50G. Standard output rating: 5 to 50 volts, 2 ma. maximum load. Voltages up to 250 v. can be handled under certain conditions.

EXCITATION REQUIREMENTS: 0.5 va or less with a-c up to 500 cycles. The Syncoverter will operate normally under sine wave, square wave, pulse, or special wave shape excitation even-ments, also applicable to pulse circuit operation.

FREQUENCY: Operated on a fixed or variable frequency, response up to 2500 cycles.

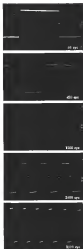
COIL DATA: Available with various coil impedances; also single or double coils for polar relay applications.

SERVICE LIFE: Life is dependent on operating frequency and loading. Typical rating: 1000 hours at 400 cycles.

Bristol Syncoverter Switches are available with either "make-before-break" or "break-before-make" switching action. They are valuable in the microvolt and milliwatt power ranges. Costs are remarkably small.

If you have an application requiring a high quality synchronous rectifier or inverter, write to The Bristol Company, 150 Bristol Rd., Waltham 24, Mass., outlining your requirements. We can help you.

*Trade Mark



RECTANGULAR WAVEFORMS photographed during 100:1 switching of a typical Syncoverter at various frequencies in circuit shown.



SCHEMATIC of Syncoverter and Oscilloscope during the above test.

4-30



**FINE PRECISION INSTRUMENTS
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to while the plane is on the ground. With one conscious astronaut, the cost differential between models will be the cost differential of the powerplants. Right now, with handbuilt jet rockets, the figure is about \$12,000; but there are indications that the differential will be reduced to about \$12,000 with production turbines.

Robertson is looking toward a figure of \$50,000 as a first cost for the first vertical-flight model, with production turbine engines, he expects that the cost of the aircraft will drop to about \$15,000.

Next Step—When Robertson completes the program for the Army, he will have a prototype Skylark constructed by the GAA, plus one leg up in an application for the Army Transportation Corps.

Producers of the first two models—to be powered by reciprocating engines—are slated to begin this month. Concurrent with that, Robertson will see a series of development tests with the aircraft and with models to optimize the design of the vertical-flight job. (For example, thrust position was fixed by extrapolation from available data, details might be gained by carrying out systematic tests of the thrust position.)

After that, Robertson looks to the expanding market for business and military planes in one natural spot for the Skylark. He believes that the sea, coast, economy and safety features of the airplane will make it worth careful consideration by prospective business buyers.

New Hygrometer for Upper-Air Humidity

Increased accuracy and reliability in upper-air measurements of humidity are indicated as a result of performance studies on a new electric hygrometer developed at the National Bureau of Standards.

NBS heavily research a part of a program sponsored by the Aeronautics Branch of the Navy's Bureau of Aeronautics. The hygrometer development was started because of the need for better accuracy in upper-air measurements.

Current types of hygrometers are limited in response rate, particularly at low temperatures. Balloons now ascend at 1,000 fpm, and higher rates are expected. Furthermore, most of the flight is at low temperatures. This combination of factors made a new hygrometer a necessity.

NBS scientists Arnold Weder and Albert Kilduff led a group in the Physical Instruments Lab in the development work.



If you are one of a select group of men that can offer valuable contributions to its application and effects, why not look into Fairchild's career opportunities?

You probably know that Fairchild is now producing the C-123 Aircraft, as well as the world-famous C-119 Flying Boxcar. But did you know that reconnaissance aircraft... jet fighters... and jet bombers and transports are on the drawing boards too? These diversified, stimulating assignments increase the incentive challenge to Fairchild's team of qualified aerodynamicists.

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You'll be investing wisely in a secure future if you take time today to write to Walter Tykes, Chief Engineer, outlining your qualifications. Your correspondence will be kept in confidence, of course.





BARROWITE STUDIES: (1966) small jet engine, and (1968) turbojet, highspeed transport engine series 2135 program.

Designs Aim at Copter Drawbacks

The perceptual principle is the subject in mind of the cerebral complaints in hallucinogen drugs, believes L. E. Laskowski, a Brooklyn consulting engineer.

To back up this contention, Lukowitz has designed a family of helicopters and compound aircraft in which a turboprop engine is used to drive a rotor and to provide forward propulsion.

- Complexity and its associated cost.
- Tough maintenance.
- Excessive vibration.
- Forward speed limitations.

Operating Cycle

Present power-plant cycles generally have used the air first from the gas turbine or from an engine-driven compressor to supply

The energy Lookwoods chose to use the exhaust directly from the turbojet unit and to valve it in the intake for lift as through a conventional exhaust nozzle to provide his wing thrust.

The robot operates in two phases: either as a helicopter robot, when it is being driven by the thrust from the pressure jets all right, or as an autogyro robot, when it is autocontrolling in forward flight.

One additional step—drawing—is performed by the exhaust. The "rubber" piston operates a valve which bleeds the exhaust through steering nozzles located on the aft sides of the baroque.

Four Models

There are four current designs in the group. Lukarevich has proposed two as well and carry pilot and passenger; the

I. B. Loshkowitz is a graduate engineer with degrees from Cooper Union. He has worked on the development problems of inter-wing aircraft for about 25 years, including research and windtunnel tests at the New York University Daniel Guggenheim School of Aeronautics.

Leachville is a licensed professional engineer, and a member of the National Society of Professional Engineers, the American Society of Mechanical Engineers, the Institute of the Aeronautical Sciences and the American Helicopter Society.

what pair are transports with 21-25 person
get separate plan cars.

All four models feature manual or automatic control of collective pitch. They also are designed for the optional use of intercomms with the engine.

Control system is conventional, multi-loop cyclic pitch stick and a collective pitch stick which operates a swashplate to drive the rotor blade angles.

Lubricants make that proper material selection will solve the problems of a rotor design which must withstand the high temperatures of the turbine exhaust. For the case of vertical flight, the horsepower required is considerably less than that for level flight at maximum speed, and so the exhaust temperature is less than 1,000°F.

Lukawski proposes the use of Inconel X for the rotor blades, fatigue strength of the material is very nearly a maximum at that temperature, and creep is relatively unimportant.

One Bearing

Only one item bearing is required for the vote, he says, and the design elements—gear boxes, propellers, tail rotors and long lengths of high-speed shafting and their associated bearings. He believes these factors should pay off as reduced fuel cost, maintenance and (and so on) reliability.

There is a spherical joint at the rear end

As a high
and low temperature
diaphragm
and hermetic
seal . . .

SILASTIC Stays Elastic

By using a "bowtie" design, Stephen Barick, San Francisco, Calif., has produced a biologically strong, lightweight web that weighs only about half as much as conventional web and stretches only half as much. It often opens with less than half the effort required by standard "stretch material" webbing.

The Atlantic dipterocarpaceae consists of families that sporadically occur on the Atlantic coast and inland areas even at $\sim 50^\circ\text{F}$. *Fraxinus* problems and red spruce susceptibility associated with insect dipterocarpaceae also identified. Openwood life in the range 1 million years or less is known at the level of dipterocarpaceae in basins.

Randomized permeability tests indicate that in effect, a barrier is maintained for more than 12 post-injury minutes up to 100 psi before leaking to post-leakage is rupture and no change in the diaphragm has been observed even after 12 hours' immersion.

*E. M. BULL, JR. IS DEPARTING

and leads, or sets which are inductive or Axiom 4.

Originally designed for marine use, the control and quick-release system, the new marine switch is being applied to automotive and commercial working vehicles, machine tools and other equipment exposed to liquids or moisture.

Does the kind of performance that has established Rhomac as an ideal display material where pressure must be maintained despite temperature extremes, weathering and oxidation, or in contact with a variety of oils and chemicals. Rhomac is also unique among solid-state plastics materials because it possesses high thermal conductivity with excellent resistance to moisture, corrosion and to fungus.

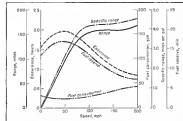
That's why, if you need a rubberlike material that retains its elastic properties and its resistance to temperature from -100 to 100 F, it goes to consider Silastic. One

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PERFORMANCE in hovering and forward flight of compound-insect-like LINC



Gilfillan Announces World's First 4-in-1 Radar

New Gilfillan GCA Quodradar
provides Surveillance, Final Approach,
and Airport Taxi—four radar functions in a simple
one-scope equipment weighing less than 1800 pounds.

For the first time, the complete answer to radar traffic control is one light-weight low-cost equipment—the new Gilfillan GCA Quodradar. One scope provides four radar functions at the turn of a switch—surveillance, final approach, height-finding, airport taxi control. Superior to all previous GCA radars in altitude,

azimuth and range coverage. The full 30° scan of both azimuth and elevation beams is displayed on the new Gilfillan Beta Scan Azei indicator—and the final approach range extended to 20 miles. The new Beta Azei display combined with height-finding to 50,000 feet in a 30-mile slant range provides advantages never before possible with one equipment.

ONE SCOPE 4 Radar Functions at the Turn of a Switch

- 1. Surveillance:** Strong presentation of aircraft, azimuth to 20-mile radius in 10-900 feet, large azimuth in 60-mile radius.
- 2. Final Approach:** New Beta Azei scope gives precision display in 20-mile sector with 30° azimuth/elevation beams.
- 3. Height Finding:** Accurate altitude information to 50,000 feet at 20 miles.
- 4. Airport Taxi:** Needle-sharp presentation of runways, taxiway, aircraft, field obstructions.

TACTICAL ADVANTAGES

The new Gilfillan GCA Quodradar weighs less than 1800 pounds, is 12 feet high. Air-transportable by cargo plane or helicopter. Antennas for operation within 2 hours; 56-60 cycle operation; weather-protected, restorable up to 10,000 feet. For the first time, complete, efficient radar control is available for advanced emergency airways.

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MULTIPLE RUNWAY COVERAGE

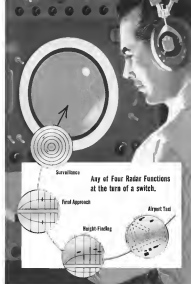
Located near the junction of two or more runways, the Gilfillan GCA Quodradar provides multiple runway coverage without retooling equipment and without expensive turntables. Azimuth rotates electrically through 360°, can be set to align instantly with desired runway.

SAFE HELICOPTER LANDINGS

With 30° scan, new Gilfillan GCA Quodradar handles steep-angle helicopter approaches from any direction.

CLEAR, GLITTER-FREE DISPLAY

X-beam throughout, Gilfillan's GCA Quodradar scope presents sharp display. Built-in circular polarization eliminates rain or snow clutter.



**Any of Four Radar Functions
at the turn of a switch.**

PROVEN EQUIPMENT

It should be emphasized that the new Gilfillan GCA Quodradar is proven practical equipment based on more than 12 years of Gilfillan accumulated experience and research in GCA radar. The Gilfillan GCA Quodradar is composed of Gilfillan-developed components of known dependability, proven in world-wide service and found reliable under the most adverse conditions—plus improvements and refinements based on the experience of 200 Gilfillan field engineers around the world.



Gilfillan Los Angeles

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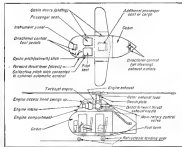
And just as vital as the superb performance of High speed aircraft nowdays G-Turbojet Igniters — engineered for rugged

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is sleeping and maintaining a normal

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of the rotor blade for flapping and deep-
lower motion.

load and 146 ms for the
spin.

Kicker blades are hinged in all designs, and the compound copies can have folding wings. These features will save storage space for both types.

Both small aircraft are powered by a Continental 160-hp. Lycoming Piston engine rated at 240 hp. (gross). Engines are two-bladed and 16 in. dia. Gross weight of both designs is 3,500 lb.

The compact Model L3903, weighs in at 902 lb., empty and has a 654-hp, turbo-diesel. Maximum speed has been estimated at 140 mph and maximum range at 141 mi.

The compact Model L3901 has a fixed wing with a 16-ft. span. Empty weight is 370 lb., and useful load is 694 lb. Loads have been calculated the maximum speed to be 210 mph with a maximum range of 160 miles.

The highspeed transport engine, Model L1891, is powered by a pair of turbo-prop engines of 1,360 hp thrust each. The engine design was planned around the Westinghouse J70 engine. The two-blade prop is 104 in. dia. Gross weight is 13,000 lb., engine weight is 33,050 lb., and useful load is 7,344 lb.

Flat, single- and 21 to 23 passages can be accommodated. Range with the smaller load is 207 ms, with the larger load it is 191 ms.

Maximum speed is estimated at 200 mph. Single-engine operation with full load will reduce flight speed but will maintain the same maximum range as with two-engine operation, says Lockheed.

The compact transport model 8.100C is basically the same size, with a higher empty weight of 10,850 lb. Useful load is 7,170 lb. Same crew and passenger accommodations are available.

Top speed is calculated at 308 mph, maximum range at 116 mi. for the smaller

load and 146 mV for the 23 percentage increase.

Higher speeds and ranges are obtained in each case with the ramped aircraft at the cost of the extra fuel burn.

Because of the small bear's erect in walk and flight or hovering flight, Lockwood has computed that any haze that passes through the lower world not appreciably affect the small flight officers.

Polymers have been used and are proving on the ropes and compound with...

Burbank, Calif.—Plans for a major B-47 jet bomber modification program are under way at Lockheed Aircraft Corp.'s Burbank Division. Robert E. Green, president of the aircraft firm, reports.

The program is scheduled to run from August 1994 through January 1997, with five re-deliveries of the bundles starting each next year. Value of the interest is not modeled.

The Maricopa Co. aircraft plant is operated for USAF by Lockheed.

"This modification program will provide the Air Force with the latest type of Stratofort," says D. J. Houghton, vice president and general manager of the Georgia Division. He adds that they will continue assistance through

diversification of manufacturing operations at the southern plant. "It will help assure stability of employment until into 1995," he says.

Modification programs include rate factors and stabilization of various stress



XB-62

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AF APPROVED INSPECTION
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born and system down that will bring B-47s up to the latest configurations. Regular cyclized maintenance plan—IRAN (inspection and replacement as necessary)—will be used.

Lockhart currently is producing B-47s at Minot and a visitor production on the turboprop C-119A cargo transport.

THRUST & DRAG

What's in a name? Boeing's new 707 jet transport has required no live during its career so far, and there probably will be others when the customers buy it. Starting in Model 707-40, designated to "Dash Eighty" for the obvious reason, renamed "Project X" for the dramatic aspects of an undercover project, and officially named as Model 707, at its christening. It was launched under a twin designation "Jet Stiletto" and "Jet Stiletto."

Two unusual features of the big transport deserve underlining. First is the registration number-N9700— which echoes the exact model number of the plane. Second is the color scheme of chocolate brown, oyster yellow, silver and white trim. Isn't that going to stand out against the official Boeing backdrop of Mr. Kaiser?

A. Farnsworth, M. Galt/Voss, has corrected the claim that Chinese Air, also a Farnsworth, made the first powered flight in 1909.

M. Voss, who built more unusual aircraft during the first World War, says that the Wright brothers just added so much dead weight to their glider when they attached an engine. They never could have gotten off the ground without the help of the wind, he says. Farnsworth, they worked for several years to increase the power of their engine, and when they finally succeeded in taking a plane off the ground under its own power in 1903, they used a French engine, says Voss.

The argument and other like it have been going on for years now and will continue to be presented. While most serious enthusiasts would not contest the claim of the Wrights, the remaining spectrum of M. Airy and R. Airy, including M. Airy and R. Airy, are related here (see 18) not from due to their out of the dead past.

Personally, I'm in favor of letting M. Airy and R. Airy decide right at it out on whatever level they now operate, with the winner to have the sole right of controlling the claim made by the Wright brothers, of consolidating their patenting research and work, of doing up that first biplane as a solidifying act.

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MARITIME RECONNAISSANCE Canadair had Canada it to build will look like this Aviation Week staff's conception.

How Canadair Will Build the Britannia

Preliminary work begins for conversion of Bristol transport design to RCAF patroller; this will be largest plane ever built in Canada.

By Irving Stone

Montreal—Canadair Ltd. is rolling up its sleeves for a huge engineering and production job. It is getting set to construct the first Bristol Britannia for the Royal Canadian Air Force a maritime reconnaissance (MR) version of the big Bristol Britannia transport.

This military version for long-range area overseas patrol, also known as the Canadair CRJ-1, will be the largest aircraft ever produced in Canada. The transport possibilities—while all efforts usually will be directed to the MR version, it is possible that other variants of the basic plane may be built by Canadair. Aviation Week has learned that the RCAF has been considering the building of a military transport version as a replacement for its veteran, Canadair-built North Star.

It is almost possible, too, that a small version of the plane may enter the Canadian production picture within the next few years.

But both of these conversions will depend on availability of suitable turboprop powerplants.

Planning Begins—Canadair's business team is looking only recently for its initial visit to Bristol Aeroplane Co. Ltd.'s Filton, England, headquarters. Engineering and production plans for the big patroller are far from being pinpointed at this writing, because a tentative drawing of exploratory work has already for Canadair's design and shop groups. Yet the picture has taken shape around for spotting general objectives and leading lines ahead.

The Canadian Department of Defense Production's license agreement with Bristol for the MR was signed at the end of February, with letter of intent to Canadair following a few weeks later. Aviation Week had predicted the MR production possibility near that a year ago, Mar. 23, 1955, p. 27.

While Canadair has not indicated whether for building the MR version, Aviation Week has learned from a

senior source that 35 planes will be built between now and 1961. Work will proceed under a five phase program. Initially, one pre-production plane will be constructed to develop tooling and techniques. The succeeding planes will be production models covered by contracts for approximately groups of 12.

Seven Wing—Engineering already has started on design changes. The original design of the Britannia will be retained except where it is necessary to modify for adaptation to military service and to accommodate the Wright Turbo Compressor powerplant which will replace the Bristol turboprop.

In its design of the Britannia, Bristol engineers have done an excellent job on structural details. Thus, the ribs of structure to gross weight a about 21,245—a very favorable value.

Canadair hopes to retain the wing design outside interest except for local changes to accommodate the new cargo. The Britannia series is uniformly tapered from cockpit to tip and its

primary structure consists of a box span with ribs with at 15% and 90% of the chord.

Turboprop Sufficient—Fuel tanks, all in the wing area, consist of two cylindrical flexible cells in each panel. Total capacity is 6,800 Imperial gallons (8,108 U.S. gal.). No more turboprop will have to be added in the MR version, because the Britannia is intended to be not as economical as the Turbo Compressor.

Also, gross weight of the MR (about 145,000 lb.) will be less than that of the Britannia Mark 300 (165,000 lb.), since the engine, equipment will weigh less than the normal passenger version. Another consideration is that weight will be saved through the absence of pressurization in the MR version.

For emergency reasons, the bomb bay might be adapted for some additional fuel tanks.

Feasible Changes—Longer flow from the construction of the MR will be the fuselage, since it will carry both the major revenues.

None portion of the fuselage will be slightly shortened. To make room for auxiliary equipment below, the cockpit and its wings will be moved to the latter allowing better visibility. All of the new nose fuselage lines will remain the same as on the Britannia. All fuselage will have many new openings for equipment storage and release.

Windows will be retained where natural lighting is required and for lookout purposes.

Detailed design of the fuselage floor will have to be changed to support the shift for auxiliary equipment carried. A portion of the cargo compartment underneath the floor will become the bomb bay.

Length of the fuselage will be the same as that of the Bristol Britannia Mark 300 (114 ft.). The later Mark 300 design, a longer than required for the MR version.

All American—In lining up RCAF procurement policies, the MR will be ordered as an "all-American" plane. This will apply not only to standards but to accessories as well (parts will be Canadian and U.S.).

The conversion job from British to American standards will be a big task. The Glenn L. Martin Co. was hired with the same job when it redesigned the building of the English Electric Canberra in the USAF's 574. Canadair will have a liaison team visit Martin to confer with its engineers on their cooperation in converting the Canberra design to U.S. standards.

American Accessories—Numerous accessories and parts of equipment will have to be replaced—either with available items of Canadian or U.S. origin, or, if not available, by equipment specially developed for the job.

Will Canadair Construct a Commercial Britannia?

Will there be a commercial version of the Bristol Britannia built in Canada? That depends on two main factors.

Will Bristol license Canadair to manufacture the commercial transport?

Will there be a "suitable" turboprop engine available in quantities by 1958, when Canadair would have some orders in which to install them?

Initially it was thought that commercial license rights would have been swapped up in the same package with the engine rights, but Bristol decided that the commercial export would have to be subject to separate negotiation. This may be because Bristol may now feel that it can sell the Britannia in Canadian markets, particularly near Toronto.

Canadair Air Lines has bought the Victoria Viscount.

Bristol's Oakes-Bristol is now building 12 of the Britannia and there is a lot of activity for its new engine, particularly near Toronto. Canadair Air Lines has bought the Victoria Viscount.

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representative of the latter stream.

Turboprop Power—The Turbo Compressor is not now used as the powerplant of the Britannia transport is built in Canada. It was selected for the MR version because it (thus) causes the plane would be required to give shift for relatively long periods at relatively slow speeds and in fairly low altitudes. The Wright Turbo Compressor fitted the job. It offers comparatively low fuel consumption, immediate availability and proven reliability of its four piston engine.

The feeling is that a turboprop engine will be the solution for a Canadian version of the Britannia since the Turbo Compressor, despite its many favorable characteristics, would not be sufficient to give a plane the size and weight of a large Britannia the speed an operator might want for its cruise value of well over 500 mph. it is claimed.

An engine is under study at Bristol which may fill the bill (see *Aviation Week* Dec. 14, 1951, p. 32). This development, probably still in the design stage, cannot be counted upon to start before 1958, it is said.

The engine is a two-stage turboprop configuration with a compressor capacity used at giving relatively high cruise power at high altitude.

It would be a constant-power engine, with a maximum shaft horsepower of about 16,000. It would give cruise power for an operating altitude of about 15,000 ft. The design also is reported as offering reserve power for takeoff from a high-altitude airport or for conditions of high atmospheric temperatures at takeoff.

more more of electronic equipment will be needed.

Hydraulic System—The hydraulic system is a good example of one of the headaches involved in converting from British practice. Canadair's engineers won't discuss the matter except to say that modification is under consideration as a prime problem.

The Britannia uses a 4,000 psi hydraulic system, generally to operate the landing gear. Other services—nose wheel steering, wheel brakes and control surface locks—operate at considerably less than 4,000 psi.

It would seem that in keeping with the philosophy to have accessories built on the side of the main, that a 1,000 psi system would be desirable to accom-



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CANADAIR fighter No. 1090. Company's approach to Rotax will depend on whether production replacement is available for the F-100.

modify these assemblies. The 1,000 psi. system has a proven record in the U.S. and Canada. The alternate scheme would be to use the British 4,000 psi. system and have the corresponding assemblies built to this standard.

In Canada's study of the adaptability of the 1,000 psi. system, weight and space requirements will have to be carefully considered, since lower pressures usually require larger components, lines, etc. Space will be particularly critical in landing gear housing area.

Another consideration that probably will influence Canada's decision will be what it costs to redesign and rebuild the system in the Rotax.

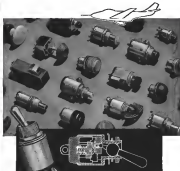
► **Tooling Look**—In engineering a progressively reduced rate of the new 20-24 month construction at the production phase will be stepped up to meet a completion date in the fall of 1996. Final production parts will be coming out by next summer.

Canada hopes to start direct labor in the tooling shop by the end of September, but there will not be a release of tool work until next spring.

At this reading, the company plans to do all its own tooling. But if a production replacement package (the F-100) comes along for the Canadair-built F-100, the tooling loads undoubtedly will increase and that may have to be subcontracted to meet both programs.

One of Canada's big problems will be the scarcity of its tooling designers, planners, etc. Its production shops have been accustomed to mass-production tooling. Because the MRC is now in a pace-time job and a large phase involving a relatively small assembly rate, the thinking is that Canada will have to go back to a prove production approach.

This means that tooling men will have to become accustomed to "live on a smaller scale." This probably will involve the use of larger pipe in which



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NAVION NOSE after modification shows 1, enlarged fuel tank opening; 2, deflector pan; 3, new heater with cold air intake; 4, air exchanger vent; 5, oil radiator air intake; 6, exhaust duct for hot air bleed.

Engine Changes Help Navion

The problem: Eliminating power plant overheating and detonation caused in a Ryan Navion 260 business plane which was averaging less than 400 hp between engine overhaul.

The fix: The Tevel (Olin) Tribon, which won and photo department operates the Navion.

The answer: The Tribon under went several months of flight tests, engineering, modification and repair by Specter Aircraft Co.'s Aviation

Service Division, Municipal Airport, Tulsa. From the data accumulated, the engine cooling system was modified by diverting heat from the exhaust stack, designing baffles and sealing elements to reflect "insects air" and eliminating "hot air." Equipment was rearranged.

Specter estimates the cost of the Tribon Navion modification at \$565. Manufacture and installation of modification parts takes 10-15 days.



ENGINE COMPARTMENT changes 1, oil radiator air intake duct; 2, "insects air" baffles; 3, added oil radiator air duct; 4, relocated oil intake

man components will be constructed, instead of using the former without as many joints and many subassemblies. Utilization of this large type of will be selected to meet the air requirement for the MR, whereas enough area couldn't be placed around a corresponding on the same production F-56 line to do the job consistently.

► **Handwork on Britannia**—Because of the relatively inexpensive tooling to be used, cost of the overall part may be higher than for comparable work on a mass-production line.

Another reason why costs of the aircraft per pound may be higher than on a line such as Canada's F-56 may be the design philosophy established by Bristol to save weight on the Britannia. Bristol, like others in England, follows the path of mass handwork because of the relatively low production rate. Evidently they are willing to pay more in production costs to save a pound of airplane weight than Canada in U.S. manufacturing normally would.

On the portion of the Britannia that Canada will redesign for the MR version, this weight-saving philosophy may not be followed to the same degree as it has been by Bristol. It is likely that Canada will find a middle ground between the Bristol extreme and better cost considerations in Canada.

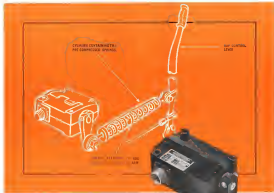
► **Subcontracting South**—At this writing, Canada did not contemplate an extensive subcontracting program because of the relatively small size of the order involved and the production rate. From a reliable source, Aviation Week has learned that the BCAP may temporarily specify a delivery rate of about one MR version each month.

However, at this point it is reasonably sure that the leading part and one gear will be subcontracted.

Possibility of subcontracting the powerplant package is under consideration. The subcontractor would get the engine from Wright Aeronautical, package it in a nacelle and deliver it as a unit to Canada. As presently located in the U.S., this is a special shop job. But Canada may do the job on its own shop if some slack time is because a production replacement for the F-56 does not exist.

Some detail machined parts also may be subcontracted, but it is likely that Canada may consider it advisable to subcontract other machine work and keep the MR job in its own shop to establish better control to meet problems which probably will develop as a result of the success of the project.

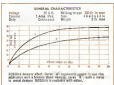
► **Tools, Production Area**—Construction of the MR probably will not involve more than \$500,000 for new machine tools and processing equipment. A large share of this will be for select and



Standard check of Airborne's ROTOLok in place of the Yawed RFP right control system. ROTOLok can be an effective index on the split-levered lever, connected to the indicator's control lever.

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over engagement for processing metal to metal bonding.

Another large area of expenditure will be for test equipment to check the MR's electronic gear.

The MR will be built in the same general area allotted to the T-36. Because that plane contract was canceled. One problem will be to accommodate the larger span of the MR wing. Chances are either that the final assembly article will be run down the line at an angle or that Canadian will follow the British scheme of going along the same wing to the center section, then removing the outer panels and reassembling them near the end of the final line. Instead of reassembling near the end of the final line, Canadian may reassemble the outer panels to the center section in the pre-flight hangar.

• **Consulting Committee—Canadian Inc.** established an 11 man joint engineering committee composed of top engineering and manufacturing personnel to facilitate the solution of problems associated with the building of the MR, ensuring that details requiring attention are brought to the proper study group. It is considered an excellent vehicle for getting things done. Meetings of the joint committee will be a matter of record, and minutes will be distributed to ensure efficient follow-up.

In its analysis of major potential trouble spots and the establishment of policy concerning them, the joint committee will take on such problems as the details of numbering systems to be used, removal of tolerances, clearance on adhesive bonding and others.

Subjects recently considered by the joint committee include:

• **Radius Bonding.** Considerable Radius bonding is used in the Reference. Some of the bonded assemblies are very large—one part as the leading edge is 31 ft. long.

Members of the joint manufacturing committee have reviewed what Radius has done with Radius metal-to-metal bonding and have sent liaison teams to several U. S. defense facilities who use adhesive bonding, to get their eyes wet. After the survey is completed, Canadian will decide on the adhesive bonding system it will use and will install equipment accordingly.

Canadian considers Radius very good but wants to evaluate it thoroughly in comparison with other systems on such factors as dwell time as well as preparation for use.

Substitution of spotwelding for adhesive bonding for some of the flat parts also is being considered as a possibility in cutting costs.

• **Interchangeability.** Model specifications for the MR stress will not specify interchangeability except by reference to a particular stress factor.

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changeability probably will be held to an absolute minimum for the purpose of holding costs low on landing.

• **Weld-test facilities.** Lengths of rolled shingles in the MR is such that Canada's built-in capacity could not lend for them if they should have to be joined in the W (soft) condition. However, it is likely that these shingles will be able to be joined, etc., in the "T" (tough) condition.

• **Roofed over much shaper gables.** This Canada (presently two) second step, first time a new trade study.

• **Extruded, long.** Roofed machine extruded bar and shape to ensure some gain outer material. Consider an investigating the matter to determine whether it is an engineering or weight-saving requirement.

• **Roofed's method of testing keeps** the A.C. is different from Canada practice. This is being investigated in order that Canada's method for this place can be established.

• **Roofing.** It is likely that Canada will use the automatic Extruded process to some degree. Some existing machines produced for the covered T-10 gables may be available.

• **Compass, importance.** Because of the large size of a number of shingles in the MR, it is likely that Canada will need large equipment for shaping shingles.

PRODUCTION BRIEFING

► **Micro-Process, Inc.**, maker of flydraulic controls and fuel injection equipment, has started production at 6000 40th St. in plant in Brown ton, Ill. The firm was founded located in Chicago.

► **Rayne Agricultural Co.**, San Diego, has secured a million-dollar contract for "a new type item" which puts the firm into "a new production field." The new contract is of a classified nature, involves discussion of large amounts of shingles, steel and alloys into with considerable welding work.

► **Trancy Engineering Inc.**, has started full-scale production at its new plant in 1000 Springfield Rd., Union, N. J. The firm, which makes conventional test equipment, now is based on a 10,000 sq. ft. building.

► **Zenith Plastics Co.**, Gardena, Calif., has consolidated all of its research, engineering and manufacturing facilities into a new division known as Zenith Plastics, an outgrowth of its parent company, Zenith Plastics, which is a firm which manufactures plastic in a form which is suitable for use in plastic and various according to company specifications.

Remington Rand.

BETTER BUSINESS METHODS

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Lycorning-Spencer Finds 10 Key Adding Machine Vital to Fast, Accurate Reports on Production Efficiency

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days. Although we depreciate the machines at 25% per year, they actually pay for themselves within 3 or 5 years." For the full story, including specialized application in this user's own words, circle CR592.

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A good machine loading system should accomplish these objectives: (1) Indicate available machine capacities for handling any new work; (2) Point up bottlenecks and lags; (3) Assure proper sequence of job handling to meet schedules; (4) Control work flow, to promote each unit in the shortest possible time; (5) Indicate work-in-process inventory at a minimum; (6) Control production by insuring performance against an established plan, resulting in better customer service and lower costs.

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Two Proved-in-practice Systems for Tighter Tool Control Provide Seven Time and Money Savings

Here are two simple, sound tool control systems that assure tool charge-outs and returns in less than a minute while providing close control and accountability on all tools, past and due.

Both systems start with a three-part form which provides control by tool, centrally by worker and a worker's copy. From here, the systems branch into control by Kaleri-A-Matic or Kardex Visible system, depending on whether or not detailed perfor-

porting of withdrawals and returns is required.

Both systems result in these seven time and money savings: (1) More work hours available; (2) Reduced tool investment; (3) Reduced tool breakage; (4) Reduced tool loss; (5) Reduced tool repairs; (6) Reduced purchasing costs; (7) Streamlined allocation of tool costs. For more information on these systems for tighter tool control, just circle KD611 on the coupon.

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The drop-plate principle of heat exchanger construction—developed and patented recently by Janitrol—is in the news again...in Janitrol's new Purge Gas Generator.

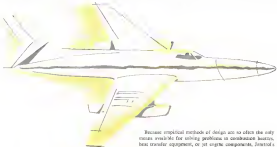
The "curing" of fuel cells against fire or explosion has long been an imperative goal of safety-conscious aircraft builders and operators. But the heat exchange problem involved has, in the past, demanded units too large and too heavy to be considered practical.

Now Janitrol has done it simply and successfully, with the reliable, light weight Purge Gas Generator pictured at lower right. Using the drop-plate principle, which puts highest performance out of high temperature alloys in lightest weight sections, Janitrol solved the heat exchanger bulk problem, and produced the generator shown—now approved for one of today's "hotter" production jet aircraft.

The drop-plate principle can be applied to liquid-to-liquid, liquid-to-air, air-to-liquid, and air-to-air problems of heat transfer and gives designers greater flexibility in size, shape, and duct configurations.



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Because empirical methods of design are so often the only means available for solving problems in combustion heaters, heat transfer equipment, or jet engine components, Janitrol's 37 years of experience in combustion equipment engineering offers you a uniquely valuable "proven reserve" of information and manufacturing skills. Whether your problems are routine or pioneering, we invite you to phone us when your nearest Janitrol representative.

If you do not have a copy of "Heat in Harmony," an interesting and fact-filled story of Surface Combustion development, we'll be glad to send you one. Write, on your letterhead please.



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A—A group of AC engineers at work in part of the Military Products Engineering Section at their Milwaukee plant. B—A group of AC's Military Products Engineering at the Milwaukee plant. C—Three senior engineers in the AC's field effective grouping of machinery and equipment is utilized to insure greatest economy and efficiency in manufacturing.

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AVIONICS

GE Cuts Down Field-to-Factory Gap

• Special report system gets data on equipment failures home fast for quick analysis, action.

B. Philip Klein

An important tool for increasing the reliability of avionic equipment has been devised by General Electric's Electronics Division in Syracuse and recently put into operation. It is a new system for speeding the all-important flow back of information to design engineers so let them know how their equipment is performing in the field, making it possible to spot potentially serious troubles before they become epidemics.

The GE system employs a special type of air field engineer's reports. With it, their observations can be quickly and easily converted for automatic data sorting and tabulation.

The system's operation was first described by GE's R. R. London before the Institute of Radio Engineers convention in New York, and more recently by F. G. Fitchell at the Conference on Avionics Electronics in Dayton.

After only three months of operation, the new method has proved so useful that GE's Electronics Division is expanding its use for commercial as well as the original military equipment. London told Avionics World. Other companies are also reported interested in adopting the system.

► **The Battlebook—Reports** from a company's field engineers are a primary source of information on equipment shortcomings in service use. As most instances, these reports are filed but once a week, and sometimes lack with precision, style, and sometimes facts with precision. Sometimes important details are omitted. And their value and completeness varies with the individual author, London points out.

Back at headquarters, skilled expeditors must read these field reports to extract pertinent data and to try to spot significant trends. This, plus the considerable clerical work involved, is tedious unless data between the field and the base that resolves at once can be initiated in the factory.

► **GE's Approach.** The Government Marketing Dept. of GE's Electronics Division conceived that the whole process could be speeded if field reports were put into IBM cards and machines were



FIELD REPORT form provides quick way for getting failure data into IBM cards.

used to sort and tabulate it. But before this could be done, field reports would have to come in a certain form that the data could easily be translated to IBM cards in semi-detailed procedure.

"Elements of Failure Report" cards, approximately the size of an IBM card, are the language of the GE system. These are specially marked, located in checkbook fashion, small enough to slip into the pocket of a field engineer (see photo above). They enable the field engineer to make an on-the-spot report when he goes out on a trouble call.

► **Speedy Reports—Only one malfunction is reported on a single card, and the data's accumulation of cards is mailed back to headquarters every 14 days. The card has space in which the test equipment, date, type of equipment, in service, and component involved, to go with other model and serial numbers.**

On the lower portion of the card there are spaces which the test equipment checks to give more detailed reference to the malfunction, including:

► **First indication of trouble.** The card lists such symptoms as unexpected, intermittent, low performance, noisy, off frequency, out of adjustment, overloading, unstable, other. If none of the above listed apply, the field engineer

can write in all the details on back of card.

► **Type of part failure.** Approximately 1,000 different types of electrical and mechanical failures are given code numbers and listed in an accompanying in situation manual. Of these, however, approximately 25 of the most common are listed on the card with small squares for checking. If the type of failure is not one of those listed on the card, the test equipment in the end number which applies. If the fault is not one of the thousand which are considered coded, it can be described on the back of the card.

► **Cause of failure.** Cards list such things as faulty packaging, unsatisfactory initial test, manual operation, storage or age, associated failure, or other. If use of on-the-spot codes no desirable types of component failures appear that all parties have a common understanding of terms, London explained. The instruction manual which lists the 1,000 coded faults includes detailed definitions of each.

Carbon copies of each field report card are returned in the field engineer's book for his future reference.

► **Analyzing the Data—When the cards are received at the factory, their data is promptly transferred to IBM cards. Once this is done, IBM machines can quickly sort out a variety of useful in-**

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AUTOMATIC machine quickly sorts EPM cards based on field reports

location. For instance:

• Number of equipment failures, according to type of equipment, type of failure, environment (ground, sea, or ship-based)

• Number of component failures, according to manufacturer, type of component, operating environment, type of equipment in which used, etc.

One such tabulation, shown below, lists component failures by type of equipment. This group of five systems which suffered the same type of failure (shaded area) flag attention as a component which has been investigated.

• Spotting Trends—Thanks to the new system, GE was able to prevent an epidemic of spring failures in a radio coupling by spotting a trend after only a couple of failure reports had been received. Losses averted. As a result, the factory could take corrective measures and field engineers were alerted.

The system also helps to pinpoint areas where effort will pay the biggest dividends. For example, in one month a total of 109 component failures were experienced in the field with a certain type of motor. Analysis showed that of these 109 components, only nine



TABULATIONS made from IBM cards group failure data in various ways



"Looks like another one of those hub-bub huddler with the man from Fafnir."



Fafnir KPM 8 Ball-Aligning Turbine Type Bearing

Teaming up with leading aircraft designers on advanced aircraft bearing design problems has been a specialty of Fafnir Bearing Engineers since the "rolling-wire" days. Recent result of such teamwork is the Fafnir KPM 8 Ball-Aligning Turbine Type Bearing developed for large applications and push-pull controls on modern, high speed aircraft. The Fafnir Bearing Company, New Britain, Connecticut.

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Russell P. Hay

"We Speed Repairs—Cut Maintenance Costs With Cherry Blind Rivets," Says This Fixed-base Operator

Home base airports and private airports—the very backbone of aviation—rely on maintenance for private planes—most require continued good service and reliable repair work in reasonable time. They know from experience that they can do dependable work—quickly and economically—when Cherry Rivets are used for a myriad of fastening jobs.

That's why Russell P. Hay, vice, maintenance, Canada division, at Pittsburgh's Allegheny County Airport, uses Cherry Rivets for all service, maintenance and repair work in his FAA approved shop for aircraft airplanes.

Mr. Hay says, "We speed repairs and cut maintenance costs with Cherry Blind Rivets. Experience has shown us that they can replace any primary or standard and even low grade rivets with a minimum. We use them in a variety of ways from replacing entire wing sections in aircraft wing sections of controls and maintenance personnel. With Cherry Rivets, we mean you do the job right and quickly—they help complete repair jobs faster, which means lower maintenance costs. This is true in hundreds of home base

airports and major airports service stations throughout the world where dependable, speedy Cherry Rivets help in repair work—provide a fast, safe, secure method of fastening in hard-to-reach places.

The use of Cherry Rivets speeds repairs by eliminating the necessity of removing entire sections to gain access for replacement of damaged sections and parts. They are installed by one man from one side of the work by a special gun which pulls the stem into the hollow blind—inserts the end of the blind stem—firmly checks the rivet in place—fills the hole—all in a split second. There is no heating—no hammering—no cooling.

With Cherry Rivets, shops get out of the shop faster, make plans for other jobs—the owner is satisfied his repair cost is low and his repair bill is low.

Cherry Rivets are fast one of a group of 12,000 types of fasteners and special blind fasteners, parts produced by Townsend in its several plants. As "The Fastening Authority," Townsend helps you speed repairs and digital maintenance—helps you improve your operations with Cherry Blind Rivets.

types had suffered two or more failures. CSE was then able to concentrate its efforts on finding the cause of failure of these same types.

The new system has also provided data which suggests that peroxide contamination beyond a certain point may not pay off. London radiolabels for that reason the need provides room for the field engineer to reduce whether component was replaced as a result of peroxide maintenance program. With this data, CSE hopes to determine the point of diminishing returns on peroxide maintenance.

Future Possibilities—One of the great advantages for the CSE system, London believes, is in determining the number of spare parts needed for both military and commercial electronic equipment. Military equipment in spare parts sometimes costs as much as the base equipment.

London pointed out that all of the wireless ordering information is on the failure card, including stock number, the person requesting the part, his address, and the contract to be charged. Thus the supplying of replacement parts could be tied into the failure reporting system. The signal punched card could be used to make the acquisition automatically and could even make up the shipping label, London says.

Component making even information in the new system may address their inquiries to Richard R. London, Government Marketing Dept., Electronics Division, General Electric Co., Syracuse, N. Y.



INCREMENTAL motor made by Stepper

New Developments in Computer Components

A new digital computer stepping motor which converts digital pulsed input shaft rotations at speeds up to 30 pulses per sec will be manufactured and marketed by Stepper Motors Corp., Los Angeles, according to Norberto Avonik which developed the device.

The incremental motor has been used in USAF equipment built by Northrop for the past two years. Stepper Motors has been granted an exclusive license.

Other new developments in the field of computer components include:

- Resonance head, for use in mag-

netic data storage devices, features a new ferrite core which provides higher operating frequency and size than, according to manufacturers, Electronic, Inc. Resonance frequency is 530 kc, constant 1/2 inch diameter head is 40 lb. Company's address: 1607 Flower St., Glendale, Calif.

• They mechanical differential for engine components is only slightly larger than a paper clip. It has a seal-like hemlock torque of 0.001 or so and



MECHANICAL differential for computer

12 minutes of use of last motor, according to Ford Instrument Co., 3110 Thomson Ave., Queens, N. Y.

New Meters Aid Lab Operations

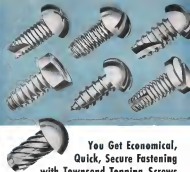
Test and measurement operations in electronics laboratories may be aided by three recently announced devices.

• Phase meter, Type 401, for measuring phase difference between two signals, with frequency range of 1 to 150 kc, with error less than 1% or 2 deg, according to manufacturer Metre has three selectable ranges, input as potential of one megohm. Manufacturer is Advance Electronics Co., Inc., 451 Highland Ave., Passaic, N. J.

• Power meter, for measuring true value over frequency range of 4 to 4000 Mc, has, according to manufacturer, a true, single-point probe for direct coupling, with rugged power sensing element capable of withstanding 150% overload. Device has two scales: 0.20 watt and 0.100 watt. Manufacturer is Federal Electronics Corp., 108 Metropolitan Ave., Roseland, N. J.

• Frequency meter, Models LA-5, LA-6, and LA-51, covering the frequency range of 10,000 to 1,000,000 Hz, and 500,000 Hz respectively and having reported accuracy of 0.001%, are available from Lenco Laboratories, Inc., Margateville, N. J.

• Peak voltage converter designed for use with an oscilloscope for making electronic voltmeter, permits measurement of peak voltage up to 70,000 v, over the frequency range of 50 cps to 10 Mc. Manufacturer is Scientific Instrument Research Corp., 911 13th Ave., St. Vernon, N. Y.



You Get Economical, Quick, Secure Fastening with Townsend Topping Screws

You enjoy the economy of quality when you use Townsend Topping Screws. They are made to provide in any method of security, fastening, sealing, shearing, wood, asbestos and composite work efficiency.

The use of Townsend Topping Screws allows efficient corky turning operations in the production of threaded forms, a saving thread when the screw is driven into the material. They are made and in steel, cast, and a variety of non-metallic materials. They may be inserted and replaced without impairment of their holding power.

Townsend Topping Screws have an extra-stiff steel which provides a true, strong, thread-cutting force which acts as a tap when the screw is driven into an unthreaded hole. By cutting their own threads, these screws fit tightly and resist loosening.

from wherever. There is no chance of free discrepancy between screw and tapped hole.

Townsend Topping screws are available in the types shown here in a variety of base styles with slotted or Phillips recessed end hex heads. They are but one group of the Townsend family of 16,000 types of standard and special fasteners and metal parts used by all industry to improve assembly and speed production.

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QUADRADAR does four jobs: air surveillance, precision approach, height-finding, aspect surveillance. Its two main parts: antenna pedestal (1), console (2).

Low-Cost Radar Combines 4 Jobs

Small but versatile is the best way to describe a new 4-in-1 low-cost airport radar developed by Gulliksen Inc., Inc. It can be used for surveillance, precision approach, height-finding, and as a radar warning radar. The new "Quadradar" is particularly suited for use as medium-range civil airports and at frontier military fields.

The Gulliksen "four main's GCA" weighs 1,250 lb and at priced at \$27,500, putting it in competition with the recently introduced Laboratory For Electronics SPAR (Aviation Week May 5, p. 14). Both operate in X-band (2.4 m), but SPAR lacks the full hemisphere surveillance feature of the Quadradar.

Gulliksen says it expects to deliver production models of its new Quadradar within 10 months.

► **Operating Modes**—At the flip of a switch, the Quadradar operator can select one of three operating modes:

► **Air surveillance**. Full 160 degree azimuth coverage for small aircraft at distances up to 20 miles (3,150 sq mi., or 40 miles for large planes (12,000 sq mi.). In this mode, electronic antenna is automatically driven to a horizontal position where it will not obstruct views of the runway entrance.

► **Precision approach**. Provides location, altitude, height, and distance information on approaching aircraft, covering a 10-deg azimuth sector and a 7-deg elevation sector (—3 to +6 deg). Wide angle of search permits single "concentric" of elevation returns enables Quadradar to serve two parallel runways up to 1,000 feet apart.

► **Height finding**. Provides height-finding information on aircraft within a 10-mile radius at altitudes up to 30,000 feet, Gulliksen says. This is done by extending the usual vertical scan

sector from 7 deg. to 11 deg. (—1 to +50). This feature is particularly useful for jets which make straight-in approach from high altitudes to crossway, and for helicopters which make non-straight approaches.

► **Aspect surveillance**. When aircraft intrude in depressed to illuminate the airport runways, and range reduced to five miles, Quadradar gives tower operator a picture of aircraft and runway obstructions for timing restrictions.

► **Quadradar Uses**—Gulliksen expects its Quadradar to find applications at medium size airports which cannot qualify for government-funded instrument approach and surveillance facilities, as well as for tactical military aviation.

"At airports with 150 landings per day, Quadradar is capable of handling all traffic without the benefit of any other equipment and," Gulliksen says, "by adding a single inexpensive landing beacon, capacity of the Quadradar is increased to handle air traffic at virtually all airports," company says.

The set, very often found at civil airports in back-up equipment for standard ILS or GCA, to provide multiple runway coverage when wind shears make existing single runway equipment unsatisfactory. In this mode, also, by providing information to enable airport tower controllers to monitor checked aircraft over holding points.

► **Packaged for Portability**—Gulliksen has designed the Quadradar for non-permanent installation at civil airports, for easy portability in military applications.

The set can be transported by C-47 or helicopter, unloaded, assembled, aligned with receiver and ready for operation in less than three hours, company says. Its wiring can be abandoned, set can be dismantled and loaded for transport in less than one hour.

The new radar consists of two units: antenna pedestal on a fork-mounted stand, which also houses main transmitter-receiver.

► **Operator's console**, which contains a 12-in. scope and associated video circuitry.

The antenna pedestal is weathered to protect the vacuum gear from the elements. The transmitter-receiver can be removed from pedestal and installed on the central tower, if desired, for easier access. The console can be located up to 500 feet from the antenna pedestal, as up to 10,000 feet if optional receiving equipment is used, Gulliksen notes.

► **Operational Features**—Intercepting operational features of the Quadradar include:

► **Dual presentation**. When set is used for surveillance, a conventional PPI presentation with selectable range of 5, 10, 20, or 40 miles is provided. Center of presentation can be offset 10, 20, or 40 miles. When used for approach, a conventional AFD display is provided, i.e., the upper half of scope shows approach height and distance out, lower half shows airplane azimuth and distance. In this mode (used in height-finding mode), a new type scope presentation, called Beta scan, is used to increase accuracy. In the plane approach mode, the deviation from the desired flight path is shown on the scope with an expanded scale.

► **Choice of sweeps**. In addition to Beta scan, Quadradar gives operator a choice of linear sweep or logarithmic sweep. The latter expands the distance scale around the point of touchdown.

► **Clutter removal**. During use as surveillance, radar operator can switch from normal (B) scan to planimetric scan to reduce spurious echoes related from the precipitation which might affect view of other aircraft types.



► **New Composite Magnetron**—Watch for increased use of magnetic amplifiers and magnetron combinations to replace vacuum tubes in digital computers. One manufacturer has recently developed a magnetic flip-flop which operates at frequencies of several megacycles, requires only a few milliwatts of power.

► **IRE Convention**—Move-7 Exhibition at the national IRE convention this year was being held for the first time at a permanent site, the Sheraton Hotel, New York City. At Atlantic City will a new convention center, which could house the IRE show under one roof, is completed in 1957. Exhibitors are reportedly dissatisfied over this year's arrangements in which exhibits were located at the Kingsbridge Assembly in

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| Exhaust Pipes | Roller Spinners |
| Oil Shafts | Shock-Absorber Coils |
| Frame Springs | Spring Coils |
| Steam Pipes | Tractor Axles |
| Automotive Valves | Tie Rods |
| Hydraulic Brake Lines | Full Coilers |
| Hydraulic Tubes | Tractor Tubes |
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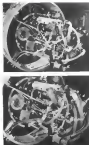
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CLEANER combustion, less compression, more compressible metal walls. Above: J-35 compressor is changed from MIL-L-7808 to MIL-L-7809.

test which all 10 items of 601 have passed with a good margin of safety (see sec. 1, 4, 5, 6, 8, 10, 12, 16, 20, 22, 24). Tests were run with East American Turbo Jet 15 (MIL-L-7808), and 15, for which there is as yet no military spec.

Flows at 100 ft. — 400 ft. per sec. have, then, been tested at 100 psi. for 30 min. Tests are then transferred to a synthetic hot oil (crude) oil.

Then the synthetic oil is pumped through the hose at 3000 ft. for 24 hr. The steel which the hose is in is completely, and at a frequency of 1,779 cpi. Pressure is 70 psi. After 24 hr., temperature is pushed to 175 °F. It takes 15 to 20 min. to reach this point, which is held for 15 min. Flow is then, good pressure tested at 400 psi. for 30 min. Full cycle tests about 24 hr.

All 30 items passed 12 consecutive 24-hr. tests (held the 240-hr. cycle) (see sec. 1) without the slightest trouble, according to Aerospace.

Shelby Life-Shelf Life of assembly is considerably improved over standard assembly because of the use of the Aero Corp. developed Little Gem fitting, the composite class. The fitting does not rely on compression of the rubber for sealing, whereas standard AN fittings do rely on rubber compression to seal, and cause cold flow and relatively rapid deterioration of the hose ends, sealed up to 1000 psi.

The Little Gem fitting uses a gasket, metal-to-metal contact (like bond

GREER TOPICS Important News of Aviation & Industrial Test Equipment



A Jet Low Compressor for the Westinghouse J-40 jet engine is checked for accurate and dependable performance by an expert inspector. Greer provides engineering and built the test machine shown to meet the precise test requirements of Westinghouse.

Westinghouse Jet Engines Under Rigid Quality Control



Greer Hydraulic Control Pump Test Stand meets the high quality control standards required at Westinghouse. Components are inspected under directed light conditions.



Westinghouse Jet Pump for J-40 jet engine gets thorough inspection with Greer Jet test stand. Asbestos readings from sensors and papers denote complete dependability.

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Greer Test Equipment subjects jet components to rigorous inspection

A thorough quality control system is maintained at Westinghouse to make sure each J-34 and J-40 jet engine component will stand up in use. These complex parts are put through grueling tests under simulated flight conditions to ferret out weak points and to determine a jet workhorse. The test equipment used gives a true picture of performance.

That is why Westinghouse has chosen Greer, because Greer test machines are precision-engineered to give the same accurate, dependable results regardless of plant, state, distance or operator. Greer equipment is in use the world over by leading aircraft manufacturers and airlines.

Greer designs and builds to meet your out-of-the-ordinary test requirements, and in addition, has a completely stocked line of machines to check all systems of all aircraft—no understanding they can be ordered directly from our catalog.



as has a. Endy gapped between, a tie metal sleeve and outer metal shell of the fitting) Thus fitting condition has a lot less, however, to give actual shell life figures, according to Aeroquip officials.

Pressure limit ranges of the hose are (going from the small to the large size) Max. operating pressure 2,500-600 psi; proof pressure, 4,500-1,500 psi; burst pressure, 8,000-2,000 psi.

► **Other Advantages**—Longer, since these allow advantages for the 601 hose.

► **Increased flexibility.** Improvement in bend radius, because of thinner wall construction, use of smaller size wire in

lead, etc., ranges from a minimum of #120 for Size 3 to a maximum of #115 for Size 20. Average lifetime for all 18 sizes is 25,000.

► **Simplified installation.** Because of the hose's smaller diameter, accessibility to engine components is increased, reducing in cost, labor installation and so on to its members.

► **Better fire resistance.** Fire resistance of 601 hose is better than standard MIL-B-5511 hose is, thanks to hose 1 to 3, depending on the hose diameter, the larger the diameter, the better the fire resistance. The Little Gen fitting shows up well under high flame conditions it

is actually responsible to blow the fitting off, Aeroquip says.

Current price of the hose, including fittings, approximately 15¢-18¢ per foot of standard hose. That amount may be more than offset, however, when total cost of planning a hose into construction, since by using Aeroquip hose and couplings, substantial savings result from using less hose, substituting less expensive, standard-type fittings for special couplings, and proper selection in number of fittings, quicker installation, saving man-hours, and the weight saving for the entire installation.

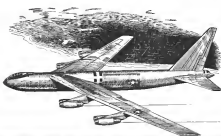
► **601 Construction**—The inner and reinforcement braid used is a MIL-B-5511 hose has been eliminated, and standard steel braid has been substituted for the carbon steel braid. The wire diameter in MIL-B-5511 hose were a constant .012 in. 20 hose size. In the Aeroquip 601 hose, the wire diameter range from .008 in. to the small size to .010 in. for the larger sizes, which saves some weight and gives improved flexibility.

On all 601 sizes, the inner tube is followed by a partial coverage of wire braid, then an outer full coverage of stainless steel wire braid. The inner tube material is a synthetic rubber, designed to use with fuels and oils, coupled with high heat resistance.

► **Advantage Hose**—The 617 lightweight development was started as a result of a Navy suggestion that they needed a lighter, less maintenance hose for aviation applications.

Minimum points out that the 617 hose construction is similar to that of MIL-B-5511, except that "a little less of everything goes into its making, the wire braid is open, using less wire . . .

Boeing B-52 Stratofortress uses SPS Precision Fasteners



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AEROQUIP REDESIGN (top photo) cut weight of this J17 assembly from 5.8 lb. to 5.3 lb. Installation time and number of fittings also was reduced.

Why Alloy Steels?



Carbon steels are better today than ever before. A major producer of both carbon and alloy steels, Republic is aware of this fact. Even so, there are limits to the application of carbon steels. Machine designs may restrict the use of a part. High strength may be an essential combination with light weight. Sometimes surface hardness and ductility must be held within the limits. Such are the applications in which only alloy steels can perform definite tasks with economy of material at lower ultimate cost.



Take large sections—where hardness must be carried deep into the steel. Heavy crankshafts, connecting rods, piston rods, large gear and axles are examples. Here alloy steels are necessary, and the cost low in proportion to results. With carbon held constant, depth hardening quality increases as the alloy content is increased.



Sometimes weight and space limitations demand that smaller sections carry heavier loads safely. For safety's sake, the answer must be alloy steels. Under repeated stress, high tensile strength and hardness do not necessarily indicate high fatigue properties. The load-carrying ability of a steel depends upon its alloy constituents and the form of the structure at the time it is bearing the load.



A problem of high pressures at elevated temperatures may present a problem. But alloy steels have proved their high resistance to creep. Some stainless alloys maintain high strength up to 1800° F. They resist oxidation—therefore do not lose their strength appreciably through reduction of action.



High elastic properties and strength may be the primary requirement, especially for welded structures. Weight reduction may be most important. In these applications, low carbon complex alloy steels offer distinct advantages. Such alloy steels at equal or higher yield points show low weld-hardening tendencies. Resistance to corrosion is improved, so is ductility of the weld. And retention of toughness at sub-zero temperatures, as well as creep resistance at high temperatures, is known.

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SMOOTHER FLOW in Aerowing elbow (bottom shows lower pressure drop)

ing, all that had to be done was to cut off the required length of hose, quickly attach a pair of fittings and a replacement was ready. Moreover, damaged hoses on longer running parking permits could be attached or vice versa.

By the summer of 1943, the Army Air Corps and the Navy had adopted the Aerowing in standard design, according to company officials. At the year's end, Aerowing's sales had soared to \$4,000,000. By 1951, its industrial sales had risen to more than 24 times its combined industrial and military sales volume in 1947. Total 1951 dollar sales, industrial and military combined, had risen nearly 600% since 1947, although most pieces of the company's products were ordered during that period.

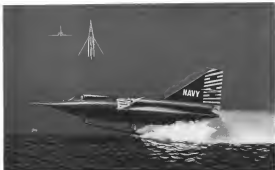
Current annual sales exceed \$20,000,000 and company assets are more than \$10,000,000.

Company currently occupies four acres at 215,000 sq. ft., of which 155,000 sq. ft. is factory. The remainder is in two plants at Redbank, Calif., and Van Wert, O.

Company now employs 505 persons in all its plants.

Fifth Anniversary

NWNA's Shinkinsmen mark the end of five years of operations this month. In this period the fleet of 12 double-deckers has carried more than 14 million passengers, more than 31 million miles. The planes, which have logged more than 115,000 flying hours, average about 10 hours a day in the air.



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World's First Delta-Wing Seaplane

The "Sea Dart" rides low in the water until power is applied to the two Westinghouse J-34 turbo jet engines. Then her hydro skis break water and the "hard" skids at a steep angle, pushed on by a thrust of 3,800 lbs. from each engine.

This revolutionary water-based plane, the Consolidated XP2Y-1, represents a successful blending of the high-speed land airplane's performance with the versatility and mobility of water-based aircraft. She's the world's first delta-wing seaplane, and the first known combat-type aircraft to utilize retractable hydro skis for increased rough water take-off and landing performance.

But her designers were not the first (nor will they be the last) — as long as planes keep going higher, faster, farther) to depend on Inco/Nickel and Inco/Nickel Alloys. Especially for parts where unusual combinations of corrosion resistance, heat resistance, strength and ductility are demanded.

Inco's Technical Service Section has a vast amount of research and service data available on the Inco/Nickel Alloys and their applications in the aviation industry. They may help you specify the right alloy for your requirements — write them.

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FLY WEATHER-WISE

These weather items prepared in consultation with the United States Weather Bureau

Forecasting clear, patchy rain about 900 feet in last afternoon, bc on ground for rapid increase in cloud cover and lowering of base, especially with steady southerly winds and clear skies above



TEMPERATURE 60°F
DEWPOINT 65°F

← Does the significance of "speed"? The less the difference between Air Temperature and Dew Point Temperature—the greater the risk of fog. Don't trust speeds less than 5° F as a guide.

In general, in forecasting fog conditions, expect no fogging with winds less than 5 m.p.h. Expect a ceiling when winds are 10-50 m.p.h. An important exception may occur when an fog below ceiling over a cold land mass with strong winds at sea near ceiling.



When observed in a control aspect, fog, an isolated situation, especially in spring when the water is still cold and may cool an onshore wind, is the dew point.

| | |
|------------------------|------------------------|
| Air Temperature 60°F | Air Temperature 60°F |
| Dew Point 55°F | Dew Point 55°F |
| Winds Temperature 50°F | Winds Temperature 50°F |



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during the cap for several leading manufacturers of Air Force and Navy jet fighters. The military specifications require operation from -1 ps. to 40 ps., with 150 ps. burst pressure. The net weight is 2.70 lb.

Feature of the cap which permits this wide range of pressure is reported to be the one-piece stainless steel design which allows a precise differential method to obtain positive seal up under all conditions.

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ALSO ON THE MARKET

Temperature detector that operates on variations of electrical resistance has been especially designed for cylinder head temperature measurement on the Wright 1150 and Pratt & Whitney 4160 and 3800 engines. The 45 deg. above and 45 deg. below dots in the head of the locking cap repeatedly indicate much of the installation and removal difficulty caused by obstruction from the cooling baffles. Flexible inverted cable protects leads from abrasion.—Thermost A. Adams, Inc., Instrument Div., West Orange, N. J.

Lubricating pump for gas turbine on gas is used to provide lubrication prior to engine coming up to speed. When up to speed, the engine-driven Model RG-5570 pump repeatedly is capable of lubricating and warming the engine. It is a non-pulsating, positive displacement, rotary-vane type. Materials are suitable for operation at temperatures down to -65°F. Operating speed is 2,800 rpm, and capacity is 24 gpm at 20 ps.—Ling, Inc., Los Angeles Div., Elmer, Calif.

Specialty fastener for use in fastening objects to structural structures in areas subjected to a variety of stress and materials to meet specific requirements. Known as Kwiklo self-locking nut, unit is threaded, with a self-contained locking feature. Body of nut is placed in the hole of the structural structure, and the connector ring is slipped into position on the outer end of the structure to lock fast in position.—Shaw Lock Corp., 5110 Bellman Ave., Los Angeles 47.

Aviation aircraft hose, is made from laminated sheets of silicone impregnated fibreglass cloth and bonded under a long-cycle, high temperature, high-pressure cure. Hose is claimed to be permanent, capable of carrying liquids and gases under extremely high- or low-temperature conditions with no loss of flexibility or deterioration.—Oxford Industries, Hastings, Mich.

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AVIATION SAFETY

CAB Accident Investigation Report

How AA Convair Hit Albany Tower

THE ACCIDENT

An American Airlines' Convair 440, N 94155, struck two of three radio towers located 5.1 miles southeast of the Albany Municipal Airport, Albany, N. Y., and crashed at approximately 6:04 1/2 a.m. Sept. 16, 1975. The aircraft was enroute on an approach to the airport when the accident occurred. All three crew members and 25 passengers on board were killed; the aircraft was destroyed by impact and fire.

HISTORY OF THE FLIGHT

American Airlines' Flight 723 of Sept. 16, 1975, was a scheduled operation between Boston, Mass., and Chicago, Ill., with intermediate stops, among which were Hartford, Conn., and Albany, N. Y. The crew consisted of Capt. J. W. Smith, First Officer W. J. Schindler, and Stewardess L. G. Thompson. Prior to departure from the crew filed a company VFR (visual flight rules) flight plan to Chicago following which the company issued a flight clearance to proceed to Albany (OTFR) (instrument or top of clouds otherwise) with an intermediate landing at Bradley Field, the airport serving Hartford, Conn., and Springfield, Mass. The alternate airport was Syracuse, N. Y.

At the time the flight clearance was issued, the weather en route to Albany was good and the conditions at Albany were also excellent. The portion of the flight to Bradley Field was without incident and the aircraft arrived there at 6:05.

At Bradley Field Capt. Smith received the latest weather reports in the company's operations office and was advised that Bradley Field had been added to his flight clearance at a second alternate in addition to Syracuse because the weather at Albany at that time was below the company's landing minimums but was forecast to improve to within limits by the time the flight arrived there. The special Albany (641) weather report available to the captain at that time was, ceiling moderate area, the aircraft, variable, zero, fog. This no-conditions weather was also.

According to the company's records, the gross takeoff weight of the aircraft at that time was 37,537 lb., which was within the allowable gross takeoff weight of 40,500 lb. The load was properly distributed with

regard to the ratio of gross loads at the moment.

Departure from Bradley Field was made at 6:14 with 25 passengers. Immediately before departing, the flight advised the tower it was proceeding to Albany VFR, AT 6:17, a message from the company's dispatcher at New York was relayed to Capt. Smith through the company radio at Albany in Italian.

"If Albany still below limits on your arrival, it OK, talk your way, suggest local airport at least 900 feet VFR. Liquid Albany to have been 0710-0500 EST. Advice had on board when over Albany." Flight 723 acknowledged and cleared, "We will hold."

At 6:16, the flight reported to Albany Approach Control that it was over Mount Quincy, Mass., an average visual check point, VFR, and requested a clearance of at least 500 feet on top of clouds to the Albany Stage Station. This request was approved and the flight was cleared to maintain at least 500 feet on top and to hold south of the Stage Station. The OTFR AT busy special weather report was given the flight: "Ceiling moderate, 100 feet, the aircraft, variable, 1 mile, fog, wind west southwest one mile per hour." Flight 723 reported over the Stage Station at 6:16. During the holding period the number of aircraft in the pattern varied from six to nine.

The special Albany weather report issued at 6:16 indicated this observation, ceiling estimated 1000, variable, fog, visibility 1 mile. At 6:18, the first of the aircraft in the holding pattern, American Airlines' Flight 783, was cleared for an instrument approach to Runway 16. At 6:20, this aircraft issued its approach call and was immediately cleared to climb toward the south and to open review at least 500 feet on top of clouds. A second aircraft which was holding was then cleared to make a similar approach and it too was found to execute a missed approach procedure. At 6:25, an instrument approach and a landing on Runway 16 were successfully completed by one of the holding aircraft.

Immediately following this holding, Flight 723 was cleared to make an instrument approach to Runway 18. Three minutes after the flight advised the tower that its approach was being abandoned because the aircraft's fuel could not be lowered. It was then still at least 500 feet on top of clouds and was advised by the tower to remain there until further advised. At approximately 6:26, the following message was transmitted from the Albany Tower: "All aircraft holding Albany. It now appears to be pretty good for a contact approach from the west. It looks much better than to the south."

Immediately following this message, Flight 723 was told by the tower if it would accept a contact approach from the west for a landing on Runway 18. After responding and receiving cleared numbers

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including aircraft seating (2004) and the length of runway 30 (4,560 feet), the flight stated it would accept a contact approach. Chastain was then issued the light to make a contact approach to Runway 30. Adverse/Ingram said the clearance was the last radio contact with the light. At approximately 0154, Flight 723 struck the side tower and crashed.

The weather reported at the time of the accident was: thin scattered clouds at 100 feet, ceiling estimated 4,500 feet, broken clouds, visibility 15 miles, fog.

INVESTIGATION

Investigation revealed that the light was at the second street the radio tower at three radio towers of Station WFTS at a point 165 feet above ground followed immediately by the left wing striking the east (northeast) tower 205 feet above ground. Three towers, located 5.1 miles southeast of the airport, are spaced to a line 200 feet apart on a true bearing of 134 degrees with their tops 718 feet above the ground and about 610 feet above sea level.

Scans last of the outer panel of the right wing including the right aileron and control mechanism from the tower began underway together with 15 feet of the left outer wing panel and aileron reported from the aircraft at this time. Following the collision with the towers, ground impact occurred a distance of 1,000 feet beyond and on a true bearing of 91 degrees from the tower hit struck. Post ground contact was made subsequently by the nose and the left wing with the terrain partially severed. Impact forces and the ensuing fire destroyed the major portion of the aircraft.

Both engines separated from the structure of impact and were found adjacent to the main wreckage. The exterior of the left engine showed heavy impact damage to cylinders 8 through 15. The lower lobes of the intermediate and rear accessory sections of this engine were missing. Other



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| 2 | Flexible Hose Conn. | 20 |
| 2 | Wheels | 1025 |
| 1 | Needle Switches and Wiring | 85 |
| 2 | Brake Lockout Cylinders | 240 |
| 2 | Shuttle Valves (Brake) | 60 |
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*Based on ignition of flammable hydraulic fluid

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components of the engine without impact and fire damage.

The engine was most seriously damaged during the left engine work inspection two-thirds of its own recovery system destroyed by fire. Both engines were severely damaged in the same way. The engine and then shipped to the American Airlines' Maintenance Base at Tulsa, Oklahoma, for a complete breakdown inspection under the supervision of a Board aircraft engine. Although these engines were severely damaged, no evidence was found from the parts examined to indicate that a sudden-cold failure occurred prior to ground impact. All propeller blades were badly damaged.

With one exception, all blades were broken here, however, these blades were found in the hands. Upon removal of each propeller from an examination indicated that the damage patterns were approximately the 70 degrees at impact; this setting is the full low pitch position.

The landing gear control handle attached to the landing gear was found in the "down locked" position. Inspection of the landing gear revealed that it was down and locked at impact.

There was no indication of fire having occurred in flight. All four C-130 engines were recovered. The value of an on-site inspection and report and the aircraft damaged, the aircraft was fully damaged.

It was determined that the flaps were in the "full up" position at impact. The wing flap, which valve and electrical system showed a maximum of external damage. Examination of the internal assembly showed that the flaps had broken between the reference valve and internal had failed due to fatigue at approximately the last third of the attack and to the aircraft. The type of failure would not permit the flap to lower the flap and the flap reference valve could not be positioned normally from the cockpit.

Examination of the aircraft and associated systems not destroyed by impact or fire disclosed no evidence of structural failure having occurred prior to impact other than failure of the flap system.

All instruments were severely damaged. The horizontal attitude scale of both the captain's and first officer's altimeters were broken off and the instruments damaged. The horizontal scale of the altimeter and 25-45 in. and that of the altimeter 20-75 in. It was determined that at the time of the accident there was sufficient fuel on board for the aircraft to have flown to a point of its destination with the normal engine.

The radio control panel was so damaged that a determination of proper frequency settings was impossible. However, by comparing the selected settings with the positioning of the component parts, selected settings were determined in full.

• **ADF Receiver.** One ADF receiver was out at 209 kc, the other at 229 kc. The frequency of the Alford H.S. engine station for the middle and outer modes are 231 and 239 kc, respectively.

• **Low-Frequency Range Receiver.** By inspecting the position of the tuning coil, it was determined that the receiver was positioned at approximately 200 kc. The reference control was in the "off" position. The frequency of the Alford Range Station is 205 kc.

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• **HIF Communications Unit.** This unit was art to 547.5 in. This is the company "T" frequency for the unit.

• **VHF Communications Unit.** This unit was art to approximately 519.5 in. The Altitude Tower is mounted on a rail guide 150 ft in.

• **VHF Navigation Receiver.** This unit was art to 120.5 in. The frequency of the Altitude Tower is 116.8 in.

• **Unit Mounting System.** This system was art to 98 degrees. The bearing of the altimeter was 180 degrees and the VOR Station was located near the intersection of the runway and the north-south runway.

No evidence was found to indicate a failure or malfunction of any of the radio receiver communication or radio range base equipment prior to impact.

All CAA equipment and loading facilities for Altitude were immediately checked and found to have been functioning properly when the accident occurred.

The subject radio towers were erected in 1946 with the approval of the CAA and the Federal Communications Commission. All three towers were hand-painted and lighted in accordance with accepted standards. The lighting system included a light-treatment device to assure automatic operation during periods of maximum visibility. These lights were on at the time of the accident.

Company personnel stated that Capt. Stevens was a well-qualified Commercial pilot, had made many landings on the Altitude Airport, was the flight instructor with the outstanding ratings, and knew the flight

of the WPT radio towers and their location with reference to the airport.

Rescue 19 is a 1,500-foot long and it was when it straight up approximately 10 ft to be made using the low frequency range.

The straight up approach in this manner is the exception. Rescue 19 is a unit relatively flat. Rescue 19 is also aligned with the automatic landing system. Although ILS was an approach that it had only been approved by the CAA a short time prior to Sept. 16 and Capt. Stevens had not received his company's authorization to use it.

Rescue 19 is 190 feet shorter than Rescue 19 and its approach is over multiple terrain. The elevation of the airport is 283 feet above sea level. According to qualified witnesses the Cessna 240 can be landed on Rescue 19, without flaps and under similar conditions of head, crosswind, density altitude, and runway slope. Also, there is a 100-foot strip of runway between 5,500 feet of runway distance provided both before personnel and aircraft personnel threat are applied.

On the morning of Sept. 16, a low pressure area dominated the New England states and a rainstorm front extended along the coast from New Jersey to Rhode Island. A small pressure wave was developing in this front and was causing a variable cloud cover over the New England states accompanied by more than one activity. Areas of clear sky were most visible at present altitude, including during the night and had conditions of ground fog and low stratus clouds developed.

At the time Flight 721 was making its approach, Altitude Airport and the immediate surrounding terrain was partially covered by patches of fog and low stratus clouds. The base of these clouds was reported to be 700 feet above the ground and the tops at 1,080 to 1,200 feet.

Also, this position of an altitude of approximately 4,000 feet, there was another layer of broken clouds. Between these two cloud layers, the weather was clear and the visibility was good. Due to the effect of weather, the flight crew's view of the runway was improving, causing various reactions of observation with a ground air movement according to the carrier weather radio. The actual visibility at the airport was reported to be one and one-half miles.

In its effect is difference in altitude or possible the flight path of the aircraft during its approach, many percent more to



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Legal receiver for automatic direction finding loop antennas, reportedly makes it possible to find combined error to a maximum of 25 degrees, giving better directional performance. It is now in production at Federal Division of Lutz, Inc. New connector is interchangeable with previous design and an Lutz four-quadrant loop.

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boarded. From observations of these persons who were considered to have actually seen or heard the aircraft it was determined that the approximate following pattern was flown: The aircraft was first observed, apparently south of the west end of the airport as it normally landing flying at about 2,000 feet. Near the south boundary of the airport it turned right toward the west end, disappeared into or above a fog bank. It is believed that after leaving this direction a short time the aircraft again flew toward the south. The direction was held for a few miles, after which a wide circular right turn was begun and terminated in a landing directly south of east. This latter landing was continued until the aircraft collided with the radio tower.

While in the circular right turn, the

aircraft flew over the eastern side of the Washington Army Depot located approximately 11 miles southeast of the airport. At the point the aircraft was observed by witnesses on the ground to be flying at low altitude and one witness saw it land near the airport. These witnesses stated that they could definitely hear the noise made by the aircraft's engines and that they appeared to be functioning normally. Ground visibility in this area was approximately three miles, limited by haze and fog, and there appeared to be a dense fog in the northeast in the direction of the airport.

Witnesses who were close to the radio tower said that when they saw it, the aircraft was flying very close to the two top and mid supports between patches of

fog. Several witnesses in this area said that the aircraft appeared to be "rocking" from side to side and that the engines sounded as though they were "spitting." The fog in this area (near the tower) was quite dense and ground visibility was poor. A witness who did not see the aircraft but the tower but did see it fall to the ground and that the upper structural of the tower was completely obscured by fog. A crowd believed to be a group of engine power was heard immediately prior to the crash.

ANALYSIS

Several factors had to be considered by Capt. Smith at the time he decided to attempt a contact approach to Runway 10. The result of these considerations could have been the basis for his decision, and also could have had a double bearing on the manner in which the approach was executed. It is difficult to arrive at one of these factors.

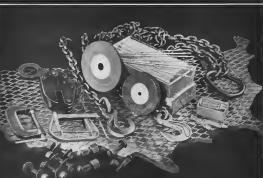
When Flight 721 arrived at Albany, it was seriously hampered by a low ceiling and reduced visibility to land, together with a number of other aircraft, at least 100 feet on top of clouds south of the Silver Knight Station. Weather conditions were changing rapidly and were expected to improve sufficiently in a short time to permit landings. A few minutes after the flight entered the holding pattern, two of the aircraft were cleared, in turn, to make standard instrument approaches to Runway 15. Both of these aircraft, however, executed standard approaches because they were unable to establish visual references with the ground surface their intended runways. A third flight, however, made a landing. This was Flight 721.

This was the standard because the wing flap could not be extended and once the flight was still 500 feet on top, it continued in the No. 1 position in the holding pattern. Approximately 10 minutes after descending the instrument approach, Flight 721 was released for the final descent but weather was clearing in the west and was asked if it would accept a contact approach to Runway 10 from that direction. After negotiating and making some communications setting, and length of Runway 10 Capt. Smith replied as the following. His specific request was the length of this run was not satisfactorily made to maintain a 1700 ft of sufficient length for the approach landing, with its structural higher approach speed and additional landing roll. His acceptance of this request indicated that he was fully satisfied that a safe landing could be made.

At the time Capt. Smith accepted this contact approach, it appears to have been a momentary decision, the weather was clearing to the west of the airport and the base of the scattered clouds were reported at 500 feet. Why the captain decided, in carrying the approach, to fly in a ground reference direction and then make a wide right hand turn to slip into the runway is not known. It is noteworthy that from his position in the holding pattern, the weather to that area appeared to be better.

The course which the pilot chose carried the flight into extremely low altitude and low. Confused with these conditions the captain should have pulled up

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Approved as AN-220-12 per
Spec. MS-44138

CONSTRUCTION—Single pole,
single throw, normally open,
double break
Rating—200 amps resistive and
motor load at 25 v d.c.,
100 amps inductive at 25 v d.c.

COIL
75 ohms, 24 v d.c. continuous
duty. Pulses 16 v d.c. max.
Frequency—2 v 0—25

WEIGHT
1.225 lbs. approximate

SIZE: 7 1/2" x 7 1/2" x 7 1/2"
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COIL
30 ohms, 24 v d.c. continuous
duty. Pulses 16 v d.c. max.
Frequency—2 v 0—25

WEIGHT
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INCIDENTS

On the basis of all known evidence, the Board finds that:

1. The action, the result and the cause were mutually contributory.

2. The result was limited to a slight loss due to its inanimate character, and its center of gravity was located within projected limits.

3. Upon receipt of the flight, Albany weather was below authorized landing minimum and the aircraft was required to hold.

4. A standard instrument approach was started and later abandoned because of mechanical failure of the wing flap mechanism.

5. A contact approach to Runway 10 was later rejected because improved weather, especially to the west of the airport, made this manner most desirable.

6. The aircraft made a wide right turn northwest of the airport to align with Runway 16.

7. The latter part of this approach was at low altitude through weather conditions which prevented adequate visual reference.

8. Under existing conditions the pilot should have abandoned this approach.

9. The aircraft struck under tower, the upper portion of which was obscured by fog.

10. These towers were illuminated and lighted in accordance with accepted standards.

11. All CAA recognized and landing facilities were functioning properly.

12. No evidence was found in the residual wreckage not destroyed by impact or fire to indicate that structural weakness of failure occurred prior to impact other than to the wing flap mechanism.

FIGURABLE CAUSE

The Board determines that the probable cause of this accident was that during the execution of a contact approach, and while maneuvering for alignment with the runway to be used, descent was made to an altitude below obstructions partially obscured by fog as a result of reduced visibility.

By the Civil Aviation Board:

At: Chas. G. Gandy
At: Harold E. Egan
At: Donald R. Ryan
At: John Lee
At: Joseph F. Adams



AVIATION WEEK, June 7, 1934

WEIGHT COUNTS



When specifications call for light weight and high pressure capacity for engine or other essential applications, you will find the new Rhodes Lewis Flycatcher engine the lightest engine. A 25 inch sphere, especially designed for air, nitrogen, helium and other inert gases, it has a volumetric capacity of 1700 cubic inches for 3000 psi working pressure. The accompanying graph indicates the Weight vs. Volume capability of these units. When in striking evidence of Rhodes Lewis leadership in the engineering and production of gas storage equipment, Rhodes Lewis Co., pioneer designers and manufacturers of pneumatic systems, including high pressure compressors, ejectors, valves, gas tanks, is ready to assist you in meeting any compression or gas storage problem.

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AIRCOACH PASSENGERS board TWA World's transcontinental "Sky Train!" Constellation at New York's LaGuardia Airport.

TWA Aircoach Revenues Top First-Class

- Low-fare service brings in greater portion of record \$187 million, with new gains forecast for this year.
- Dannon bets on future of mass market development, predicts tourist will be the air transport "breadwinner."

By Frank Shea, Jr.

Stunning gains appear even this year, TWA World Aircoach is on the way to another big year via aircoach.

One of the precursors to what has become a major exclusive bond (Aviation Week, May 24, p. 88), TWA has developed low fare tourist service to the point where it is accounting for the greater portion of the airline's total income and traffic.

► **Budget-Minded Profile**—Last year, as each played a big part in TWA World's all-time sales high of \$187.2 million in gross revenues, and officials predict that this year the tourist flights will account for about 54% of total passenger revenues and more than 60% of total passenger mileage.

"Future sales profits lie in development of the mass market," says TWA president Ralph Dannon, "and this is where we are placing the most emphasis. First-class traffic is bound to reach a saturation point in the not too distant future, and new traffic must be generated from among the budget

traveler categories who presently do not travel by air."

► **Piling Profits**—Dannon is one airline chief who does not hold rapid aircoach expansion partially responsible for the recent loss in profits. Big losses last year was an obvious no question change on nearly \$0.5 million in new aircraft he says.

In addition, TWA's international Division since the cutoff of service in 1946 through the first quarter of this year, has received only temporary and compensation at a level intended to enable one return on investment. Dannon adds:

"These low fares, not aircraft expansion have been the cause of our dipping profits" the TWA chief explains. Last year, despite the all-time high sales total, the carrier's net income declined from \$7.5 million, to \$3.36 million, in 1972 to slightly over \$5 million, or \$3.52 a share.

► **Increasing Strength**—Overall, however, TWA's position continued to strengthen financially in 1973. Stockholder equity increased to \$18.8 mil-

lion, or \$17.84 per share, compared with \$15.51 per share at the end of 1972.

In debt reduction, the company made payments of \$18.6 million and reduced the total to \$40.5 million as of Dec. 31.

Of TWA's remaining debt, \$34.6 million is scheduled for payment this year, while a total of \$6.1 million has been segregated into a special fund representing advance payments, cash and government securities to defray the cost of aircraft scheduled for delivery in 1975.

► **Record Growth**—Traffic and cargo had the greatest volume growth last year of any single year since 1946, rising to 34.7 million ton-miles from 1971's figure of 28.7 million ton-miles.

Traffic-wise, over its combined domestic and international routes, TWA carried a record 3,140,000 revenue passengers a total of nearly 3 billion per year-end.

This accounts a 23% jump in number of passengers, an increase directly attributed to expansion of aircraft services, Dannon says.

► **Breadwinner**—TWA remains confident the whole is more than the sum of the parts, over the long run, low-cost tourist service will emerge as the principal "breadwinner" for the airline industry. That prediction will be proved, but the greatly expanded market will mean



HIGH-DENSITY SEATING in domestic TWA Conquest accommodates 11 passengers.

has compensated for this, they say.

"Droiler for dollar, was highest rate of return per plane mile in domestic airline service," says Henry Fellows, TWA's director of sales research. The coach traffic is not diverted from first-class traffic but, for the most part, is new business, he notes.

► **Shorthaul Gains**—This is considered particularly significant in view of the fact that several other airline executives are on record as insisting that coach gains are made at the expense of first-class losses.

"This just is not so," insists Fellows, "nor is it true that coach is only profitable over longhaul routes. Short-haul coachwork over heavily traveled routes appears to be equally as profitable as longhaul service, he says.

Fellows cites the New York-Washington run as particularly suited to short-haul coach operations. He adds that, he points to TWA's highly lucrative mail service between San Francisco and Las Vegas.

"We have revitalized new business with our San Francisco-Las Vegas coach," he continues. "Before, people never thought of running to Las Vegas just for the weekend. Time and cost were prohibitive factors. But now, by making low-cost service available, we've stimulated their desire for short week-end vacations."

"San Francisco-Los Angeles is typical of what can be done in other parts of the country via short-haul coach."

► **Growing Trend**—TWA also rubs salt in several other airlines that are coach traffic at a moment at last. "Over the long run, this should not be the case," says Fellows. "The national scene will exert tremendous influence

"What some people fail to realize," he adds, "is that there is a growing tendency in the U.S. toward more and more leisure time. It is not conceivable that the normal week work will be shortened even further, with leisure time leading the way. The trend is there."

"Today, the average working man has more money to spend than ever before. With a shortened work week, he will also have more time in which to spend it. It will be up to the airline, in successfully competing with other consumer goods and services, to stimulate his interest in air travel."

► **Big Attitude**—Low-cost service is the answer, says Fellows. He points to a number of possibilities where coachwork will be a big attraction. In addition to off-season weekend vacations, there are visits to relatives, trips in search of new job opportunities and visits to more healthful climates in which classic all-weather all-weather previously considered beyond the reach of the average working man because of time and cost factors.

Fellows also cites the case of the small independent businessman who does not have an expense account but must draw from his own funds for company trips. With aircraft service, such cases find they can make extra trips without their budgets and expanding their business as a result.

► **Obvious Solution**—And there are the large corporations, too, notes Fellows. He points out that practically most of these firms have an established policy of always having their personnel use franchise service. Many believe this adds to the prestige of the company.

"But the slightest slip in their business, and these same firms look for ways to cut down on expenses and

bring budgets into line," he adds. "Aircraft would be the obvious solution to consistently heavy travel expenditures."

TWA president Dawson emphasizes that first-class traffic, supported largely by "expense account-type" business travel, rapidly is approaching the saturation point. He estimates that this point will be reached about the time the present traffic rate is doubled.

But aircraft leaves no saturation point, he says. "This is where we will generate our new traffic—offering air travel to the masses at prices they can afford to pay."

Contrary to opinion expressed by several other airline chiefs, Dawson is strongly opposed to any traffic that would narrow the line differential between coach and first-class. "As far as coach is concerned," he says, "should keep first-class and coach in the same proportion as they are at present."

► **Coach Pays Off**—A look at recent TWA traffic figures gives ample evidence as to how the coach's "coach program" program has been paying off. For the first four months of this year, aircraft passenger miles totaled 440,315,000, with domestic up 31% and international down 10%. Traffic showed a 47% gain.

In April, aircraft traffic topped first-class for the first time, accounting for 55.5% of total written passenger miles during the month.

Equipment-wise, TWA now has 25 Constellation with 51-seat capacity, and five 70-passenger DC-4s as domestic tourist service with 19 Constellation international service. Aircraft figures on the international routes carry 59 passengers.

► **Aircraft Outlook**—As far as TWA is concerned, aircraft is definitely here to stay, and in a big way.

Here's the overall industry outlook from Dawson's point of view. "I fully expect that within three to five years the industry will show 30% of its passenger revenues in domestic line travel, as contrasted with class service—and, by the end of this decade, the total dollar revenues will be more than doubled."

"Before that time, what we now call our tourist service will once change its name and become standard class, with the present first-class category labeled tourist service."

Hawaiian Salaries

Hawaiian Airlines paid its president, S. C. Kennedy, \$15,190 in 1953, the airline reports to Securities & Exchange Commission. Other top executive salaries paid included: Paul Strickland, vice president, \$17,500; David Watson, vice president, \$15,575; John S. Pugh, secretary, \$10,995; and Ross Cooke, assistant treasurer, \$9,500.

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Court Backs State Tax on Braniff

U. S. Supreme Court last week up-held constitutionality of tax on airlines taxes imposed by states on airline planes which land and take off on interstate flights.

The 7-4 decision was handed down in the case of *Braniff Airways* in the State of Nebraska. *Braniff* argued that its flight equipment is immune from taxation because its headquarters is not in Nebraska, the federal government controls interstate air commerce, and the tax is a burden on interstate commerce.

Sufficient Contact—The court pointed out in its ruling that *Braniff's* right to fly over the state of Nebraska goes back to the same constitutional basis on which navigable waters can be used regardless of the ownership of adjacent land. In the case of water routes, the court said, the state has the power to tax those property used in interstate commerce.

The court emphasized that past decisions held that interstate commerce was to be regulated by a new district court of the tax burden. It said the case involves only the question of whether 15 cents per day by the applicant's aircraft is sufficient contact with the state of Nebraska to sustain that state's power to levy an opportunity and income tax on such aircraft.

"We think such regular contact is sufficient to establish Nebraska's power to tax."

Protection Claim—The court then declared that *Braniff* is in the same position as railroads, truck and water carriers in that it has an opportunity to "expand the commerce, traffic and trade that impinge on its market, Nebraska... Nebraska certainly stands prospective during such steps and those regular landings are clearly a benefit."

Braniff, which was merged with Mid-Continent Airlines while the case was in litigation, makes 14 stops a day at Omaha and four at Lincoln, Neb. The original court action was filed by MCA.

The court pointed out in its decision that when this case was filed by Mid-Continent a report for 1959 showed that 95% of its revenue and 114% of its total mileage registered in Nebraska. About 9% of its total stops were made in that state. The tax imposed was \$4,250.44.

Mid-Continent brought the case in the Supreme Court of Nebraska, which affirmed the state's argument. Appeal then was made to the U. S. Supreme Court.

Frankfurter Dissents—The court decision was delivered by Justice Stanley Reed. Justice William O. Douglas dissented, making a scathing demand and Justice Felix Frankfurter, a dissenting opinion. Justice Robert H. Jackson also dissented, but did not write an opinion.

In his opinion, Frankfurter cited the court's decision in the case of *Northwest Airlines vs. Minnesota*, in which

the state was permitted to tax the entire airline fleet although NWA operated in eight states.

Frankfurter mentioned that the court majority demonstrated the "inherent complexities of the law's adjustment to such novel problems as the taxation of the taxing power over interstate carriers in a federal system."

Dissent Reasoning—He held that the profile of boats, trucks and railroad cars with airlines does not hold, saying that transportation on the ground has a "dissimilarity of duration of relationship to that state obviously not true of planes which make local stopovers for a few minutes."

As Transport Air, and the decision was not a surprise, but was more or less a reaffirmation of what most operators accept as the law. In addition to Nebraska, six other states levy similar taxes: ATA and TWA say Arizona, Florida, Minnesota, North Dakota, Washington and Wisconsin.

The Nebraska tax is calculated on the basis of a formula designed to fix the proportion of *Braniff's* component aircraft to the state. This formula considers aircraft and departure revenue were handled, and the average operation in the state.

In addition to state taxes, many airlines pay taxes to local governments, based on planes and other property.

CAB May Act Soon In Balloon Route Case

Action by Civil Aeronautics Board on the suspended *Dynacolor* flight over North-Balloon service area is expected this week, following a scheduled final meeting of the airline council.

Three new route developments:

- *Schedule* period set by CAB May 16 for settlement passed the deadline without agreement between Pan American World Airways, Panagra and Braniff.
- *Panagra* and Pan Am voted *Braniff's* proposal to transfer its South American routes, franchises and properties to Panagra, for which *Braniff* will make Panagra capital stock.
- *Braniff* expected a counter proposal from Panagra.

CAB deferred decision on the case in March for 60 days (Aviation Week Apr. 7, p. 16) to enable the airlines to establish an independent arbitrator in the west coast of South America to advise the combined international routes of *Braniff* and Panagra.

The Board figured such an agreement would set up two competitive routes.

- *Panagra* and *Braniff* have been in contact, operating jointly along the west coast of South America.
- *Pan American's* rail route racing.

At a meeting in New York May 12, PAA advised *Braniff* that if that com-

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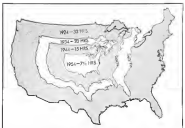
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Transport Progress Shrinks U. S. Map

Size of the U. S. steadily shrinks in time of travel thanks to a host of new transportation modes kept in scheduled aircraft routes. In 1954, mail planes covered the country in 33 hrs. During 1955 and this time

to 28 hrs. in 1956. A decade later the Dynacolor flight took another 50 hours off. Today the Dynacolor flight takes the U. S. from the West to East Coast in 7 1/2 hrs. Military jets have made it as less than 4 hrs.

pany would withdraw from South American operations, PAA and Panagra would be willing to pay a fair and reasonable price for its equipment and facilities in South America.

Bozell proposed a resolution in reply, stating that it wanted to explore ways and means of integrating its international routes and programs with those of Panagra so as to build a "stronger and more profitable property." Bozell said it was not prepared to abandon its South American operations.

It offered instead to transfer its routes and properties in South America to Panagra in exchange for capital stock in Panagra.

This proposal promptly was rejected by PAA and Panagra.

Over the years, Pan American and Panagra will have a counter proposal to Bozell's earlier measure. Andrew R. Shea, Panagra president, as in Europe and unavailable for comment.

CAB Proposes 12-Hr. Nonstop Crew Limit

Civil Aeronautics Board last week proposed to extend the present 8-hr domestic flight time limitation to 12 hr for nonstop transcontinental flights having three crew members. The act, however, must be promulgated and the flight must be scheduled "be not

more than one takeoff and landing," CAB said.

The action came while the Board still had pending a decision on a so-called waiver of the 8-hr restriction to permit American, United and Trans World Airlines to operate single-crew nonstop transcontinental flights (News Week, May 31, p. 16).

• **CAA Petition**—CAA gave the industry until July 1 to comment on the proposed amendment to Part 49 of the Civil Air Regulations.

National Civil Aeronautics Administration petitioned the Board to force America to "cease and desist" operating its out west DC-7 transcontinental flights nonstop. CAA took the action when it determined that American had exceeded a point by May 31 when it could not, notwithstanding, complete 95% of its out west trips under the 8-hr regulation by July 1.

American had no comment last week on CAA's move.

• **UAL Service**—United Air Lines began operating DC-7 service between New York and San Francisco June 1. Only scheduled trips scheduled at 74 in an hour, scheduled nonstop. Westbound flights make a stop in Denver. United begins New York-Los Angeles service nonstop both directions on June 18.

In preparing an amendment to the CAB, CAB makes clear it does so "without denying the merits of the

request for waivers." The Board says it "believes that rulemaking proceedings should be immediately instituted."

Following the civil argument held by the Board earlier, American filed a letter with CAB, pointing out:

• Nonstop flights involve less stress on the crew today than they did at the time of adoption of the 8-hr rule.

• Nonstop flights reduce a crewman's working days per month 34%, since a crew can obtain a month's flying time in only 10 working days.

• American's actual experience with the DC-7 operating operations since November demonstrates the flight's safety.

In reply to American's letter, Air Line Pilots Assn. charged that "the 35 hour monthly limitation and maximum 14-day leave control rule by rule since 1934. The 8-hr limitation was adopted as a compromise, a figure above which accident exposure was increased. One has only to compare the DC-7 service to the Boeing 247 or DC-2 and to visualize a flight from New York to Chicago as compared to spanning the entire continent to put to death American's reckless contention concerning the decrease of the stress on the air crew over the years."

The Board was expected last week to act on the waiver request although two members are absent from Washington. Jack Lee is vacationing and vice chairman Morris Deane is in Italy.

New Beirut Airport Returns Big Revenues

Beirut, Lebanon—Cedrication of a luxurious terminal building at the new \$16.5 million Beirut International Airport yields up the Lebanese airport's building from an insignificant leading step to a top commercial center in a brief four years.

The field has become Lebanon's largest single enterprise, bringing in a direct annual revenue of about \$500,000.

Last year an average of 2,795 passengers moved through the field monthly, compared with only 2,064 in 1972. In 1973, there were 62 daily flight movements as against only eight daily in 1972.

A total of 29 airlines, many of them top-ranking international carriers, are operating through the field that originally was used only for local services.

The new terminal building features an instructional lounge where travelers may buy and carry out goods duty free.

The building also has change spot for imports, export and transit goods in shadowed refrigerated rooms for perishables and vaults for gold or other valuables.

A \$114,000 structure for aircraft maintenance and overhaul parts is being constructed.

You a target?



Let's face it...we're all targets!

If your plant is not ready with a disaster plan, better act now. There's not a single American plant that's out of range of an international bomber—and fire, floods, tornadoes or explosions can kill you just as fast as an atom bomb.

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☐ Call your local Civil Defense Director. He'll help you set up a plan for your office and plant—a plan that's safe, because it's integrated with community Civil Defense action.

☐ Check contents and location of fireproof bins. Be sure they're adequate and up to date. Here,

again, your CD Director can help. He'll advise you on explosion hazards for explosives due to blast, radioactive, etc.

☐ Encourage personnel to attend Red Cross First Aid Training Courses. They may save your life.

☐ Encourage your staff and your community to have their homes prepared. Run ads in your plant paper, in local newspapers, over TV and radio, on bulletin boards. Your CD Director can show you ads that you can sponsor locally. Set the standard of preparedness in your plant city. There's no better way of building positive and good community relations—and no greater way of helping America.

Act now...check off these four simple points...then you're all set...have you a right to die?



Refugee Pilot Studies Automatic Light

At Francisco Jorda flight, Polish pilot who escaped from Soviet-dominated Poland in a Russian MIG-15 Nov. 5, 1951, reports with Adol Franco of Egypt's Civil Aviation Department, a new airport light that can be turned on by a pilot flying over the field

merely by using the word "light" into his radio microphone. Using the CAA-developed light, pilots can fly into unattended airports. The lights can be switched off after takeoff by voice transmission, completing the cycle.

CAB ORDERS

(April 26-May 1)

DEFERRED

Refined & Western Airlines application for exemption to fly two roundtrip flights carrying U.S. military personnel from Linsenhagen to New York on a contract with PanAm. TWA bid.

United States Overseas Airlines application to operate one flight between Newark, N.J., and Frankfurt, Germany.

Boeing Airways motion to dismiss the proposed proceedings in the Fargo, N.D., service case.

DISBURSED

Pacific Northern Airlines requested special reduced charter rates and charges proposed by Pan American World Airways in Seattle Alaska service.

United Air Lines proposal to provide service to persons requiring service for 21 on cargo shipments when required by order, regulation or contract of a U.S. government agency.

Proceeding rate reduced rates for U.S. Alaska, Hawaiian and Pacific States service filed by S.W.F. Inc.

Pan American World Airways proposed 11-hourly roundtrip rates for cargo between San Juan, P.R., and New York.

Northwest Airlines proposed reduced rates between Anchorage, Alaska, and Seattle for coverage of passengers on flight/intercity air route.

Alaska Airlines proposal of reduced rates for hauling mail by mail from McGrath to Anchorage.

GRANT/DEED

Central Airlines passengers to use Fort Smith, Ark., airport.

City and Chamber of Commerce of Reno, Nev., intent to intervene in proposed by United Air Lines to amend its routes as to its flight to Reno, Nev., on intermediate route alternate to Reno, Nev., between Salt Lake City and Reno.

CORRECTED

Extension of investigation joined into the coach fare between Washington and Salt Lake City, N. Portland and Tampa, Fla.

City of National Airlines investigation rate based fare between Anchorage, Alaska, and Seattle U.S. points at Salt Lake, New York, Dallas, United Air Lines and Western Air Lines.

Consideration of various applications in view of short service applications for air service of a permanent facilities.

ATTACHED

Interagency arrangements between American Airlines and Midwest Airlines and Western other air carriers.

AUTHORIZED

Temporary suspension of service asked by Boeing Airlines in Pacific States, the Virgin Islands and Caribbean Republics.

FIXED

Central Airlines temporary mail rates. United Air Lines mail rate.

EXTENDED

Trans-Canada Air Lines authorization to fly between Tampa, Fla. and Mexico City.

Champagne Flight

Los Angeles-Champagne and include for passengers highlight the new DC-6B luxury service. Western Air Lines has requested from Los Angeles to San Francisco, Portland and Seattle-Tacoma.

On the flight, named "The Californian" private cabin vintage champagne and 51st anniversary. Western passengers receive special coupons as their leave the plane.

Seat reservations of an extra line are placed as passengers may select the place of their choice when checking in at the airport for their flight.

Service schedule is arranged so that the northbound flight leaves Los Angeles daily at 4 p.m. (PDT), while the southbound counterpart takes off from Seattle-Tacoma at 4:20 p.m. (PST).

For one month, also TCA authorities to use Kansas Airport, Moh.

Letters of application issued to Air Service Inc., Commercial Charter Inc. and Country Airways Inc.

SUSPENDED

Letters of application issued to Air Service Inc., Commercial Charter Inc. and Country Airways Inc.

Board Reports Cause Of NAL DC-6 Crash

Cause of National Airlines DC-6 crash off Mobile Bay, Ala., Feb. 28, 1955 (Aviation Week File 23, 1955).

Card Administrator Board report, was due to the following factors:

• Loss of control followed by flight failure and operation of persons of the aircraft structure while flying through a violent storm.

• Failure of the cabin to replace the plane's pilot of the storm's location.

The crash occurred on National's regular Miami-New Orleans flight during a storm of tornado proportions. All 56 persons aboard were killed. NAL's aircraft was located in the Gulf of Mexico 35 mi offshore and about 52 mi north of the regular course. About 75% of the DC-6B was recovered.

Beyond Pilot Control—The Board found there was no evidence of malfunctioning controls, fatigue, failure, confusion or lightning strike. Investigation shows the plane's structure failed at a moment "when gust loads combined with violent maneuvering loads not being expected to maintain or require control."

Although a special severe weather bulletin issued at Washington, D.C., was received by National Airlines and the weather bureau at Miami and New

Orleans, no U.S. Weather Bureau advance weather reports were issued to the route traffic control to support the unexplained development and movement of the storm to its route flight. "We did National Airlines attempt to relay this information in Flight 479," the accident investigation report reads.

The Board concludes that the pilots "were kept by a most unusual complex of conditions beyond their control."

CAL sees airborne radar as a possible answer to similar future problems.

PAA, Pioneer List Executive Salaries

Pan American World Airways paid its vice president and assistant to the president, Samuel P. Pryor, \$45,700 in salary during 1953, the airline reports to the Securities & Exchange Commission.

PAA president Juan Trippe's salary was not reported because only those of more than \$25,000 are filed with the commission.

Other salaries of more than \$20,000: Henry J. Frawley, vice president and general counsel, \$42,900; Franklin Clifford, vice president, \$40,700; and John C. Leslie, vice president, \$40,900.

James A. Lauer paid as president, Robert J. Smith, \$34,650. Others reported to SEC: Harold B. Seider, vice president, \$15,650; Harding L. Law, vice president, \$13,250; Eugene W. Butler, secretary-treasurer, \$11,650; and Wayne D. Richardson, who resigned as assistant secretary treasurer Dec. 31, \$5,650.

SHORTLINES

► **KLM Royal Dutch Airlines** does not plan implementation of new version until plus about a year, according to other planes, according to M.E.A.L. de Jong, the airline's U.S. director of fuel and sales.

► **Japan Air Lines** may increase its trans-Pacific flights from two to three per week next fall. Westbound trans-Pacific has been extremely heavy, the airline reports.

► **Pan American World Airways** has stopped up its direct services from Chicago and Detroit to Europe to three flights weekly.

► **Swedish Airline** has postponed four C-47s 140s with delivery scheduled to begin this month, according to J.V. Nook, executive vice president of the Civilian Division of General Dynamics Corp.

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Must have own plane. Will be assigned territory in which to sell our light aircraft. Salary paid with bonus at end of the 1st yr. 1955. Excellent. Immediate openings.

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ASSOCIATED ENGINEERS, INC. has immediate openings in aircraft design and development. Salary paid with bonus at end of the 1st yr. 1955. Excellent. Immediate openings.

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PILOT, 35, 10 years' experience. Will be assigned territory in which to sell our light aircraft. Salary paid with bonus at end of the 1st yr. 1955. Excellent. Immediate openings.

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INSTRUMENT DESIGN ENGINEER

To accept responsibility for improving and expanding the product line of a precision, progressive aircraft instrument manufacturer.

Applicant should have a thorough background in the design and fabrication of aircraft instruments, instruments and accessories, and be capable of carrying a product development program from the original idea through design and testing to the final production stage. This is an exceptional opportunity for an individual, responsible, energetic who wants to become associated with a small company in which ample opportunity exists for advancement based on merit and self-direction.

Please submit resume giving full pertinent details and outline of experience, plus a current photograph, if available, to:

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A Real Opportunity Exists for an Experienced Top Caliber Weight Engineer to Originate Advanced Weight Evaluation and Estimation Methods for Development of Carrier-Based Fighter and Attack Aircraft

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are to be found each week
in the
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United's DC-7 Record

Breakfast time in New York and dinner in Honolulu, without pit!

United Air Lines airlifted a group of authors, press, radio and television people on the one-stop flight of 5,000 mi. on May 24—thanks to the new Wright-powered Douglas DC-7s. Free press express!

The time was 16 hours and 31 minutes, including a stop of almost an hour in San Francisco. This was a new commercial record between New York and Hawaii.

The few hour difference in time between terminals helped, but even so, we left Idlewild well after dawn on that "dawn to dusk" hop, and we were on Honolulu Airport before dusk.

United devised this dramatic record-breaking flight to illustrate the speed and comfort of the Sevens, which it has put into transcontinental service this month. Sevens will operate to Hawaii beginning early next year, United's president, W. A. Patterson, said.

Airline people who think a 17-hour flight is necessarily uncomfortable should have themselves up to date and realize how rapidly this airline development is moving.

Engine synchronization, vibration and resolution problems are being solved in steady fashion, although there was never a new plane yet without its teething difficulties, and we suspect these never will be. But if a 10,000 mi. trip with United Air Lines is any criterion, progress is noted. Those in charge of cabin comfort deserve praise. Passengerette appears to have reached a new peak in efficiency, removing much of the fatigue from the passenger's high-altitude flying.

This may be the jet era, but it is doubtful if any jet transport yet available could have equaled the Seven's record flight over this 5,000-mi. stretch—whether you consider elapsed time, economies or comfort. After a trip like this, you know very well why the jets aren't on U.S. airlines yet.

Hawaii Is Air Minded

Hawaii is something of a dream world even for aviation enthusiasts. It takes a visit to these islands to realize how the airplane has taken over from all other transportation modes.

The two competing airlines, Hawaii and Trans-Pacific, have locked out scheduled passenger boat service between the islands. A slow barge service remains for heavy freight.

When a native, or anyone else, goes from one island to another by boat. When he leaves, his suitcase is piled into a DC-3 fighter with rifle or no cutting or packing. Airline passengers use the transportation of the freedom by air doesn't cost any more than the cutting charges would be in this country. The truck delivery at each end of the journey is short, because of the small size of the islands.

Inter-island airlines in Hawaii have no competition from steamers, motorboats, bus or motor cars.

And when one of the active volcanoes spouts it sends the islands' entire population wants to go on aerial night

seeing cruises around the spectacle. Every plane that arrives can spare a pressed into service, about around the clock, for 30-minute cycle runs. Plane utilization at these times is out of this world.

In these respects the islands meet their reputation as a paradise. But the airline operators have their problems. They feel the luxury tax on travel is unfair to the residents and the airlines, because air travel is vital, the air is vital. Competition between the two air transport lines is bitter, and there is strong opinion that adding a second company has cost the government money in subsidies. Because of this remote location, the lines have problems not encountered on the mainland. Some of the simplest problems of mainland airlines become tough riddles to crack on agricultural islands over 2,000 miles west of California, and many CAA and CAB regulations that are enforced don't make much sense out on Hawaiian operations.

Nevertheless, the airline is king in Hawaii transport and we hope a bright young transportation student makes a study of this phenomenon for an advanced degree some day. The facts would add to his library.

Easier to Fly Than Kites!

We thought the era of the glider parameter of ray-based helicopter projects had run its course but the media bring us new material.

Helicopters have a tremendous future. No other aviation publication has provided so much information on the development of this art, or has exposed so much confidence in its potentialities.

Perhaps because of this deep interest in the most scientific vehicle ever designed by man, we are struck by the dangers of the wrong kind of publicity. To maintain the public with unscientific and pessimistic that are beyond today's or even tomorrow's possibilities is unfair, to say the least. It is as service to mankind.

We have before us a paper release with the headlines, "U.S. to Fly Above Traffic Problems, Finally Helicopter Is Easier to Fly Than a Kite."

We said "If your budget will stand the strain of a higher priced air, you're in the market. If your coordination is good enough to drive a car, you can learn to handle the new two-seater aircraft in a few hours—or a couple of days, if you want the stimulation of traffic."

This new model, we are told, will "make its bid" to become the American family's second car before the last office to machine log is made this summer.

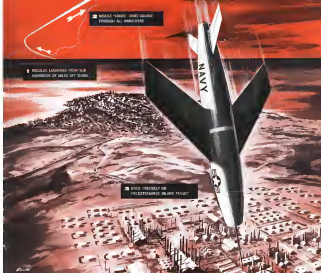
Furthermore, we are reassured that the company is offering not only its product, but its profits to the public.

"So, anyone with a few dollars—which might be scheduled to chase the pointer or sent in a savings account—may get on the ground floor of this aviation production business...right now."

It is also interesting to note that the company is closely withholding any technical information about its proposed product.

Probably with good reason!

—Robert H. Wood



Sub-Launched Missile Gives Navy New Striking Power

CONTROL OF MISSILES HELD—UNCERTAIN

"SERIES" CAN BE RETRIEVED DURING TESTS

THE STORY BEHIND THE STORY

When a guided missile launched from a submarine hundreds of miles off shore can be held on an accurate course at speeds approaching Mach 1, and gradually aimed at a specific inland target—that's news, first news for a possible enemy. And, when early models of the missile can be recovered and re-used after time for evaluation and training that's news too—good news for American taxpayers.

On both counts, the Navy's Regulus, developed by Chance Vought Aircraft, Inc., is constantly in the headlines.

Providing the stability that holds Regulus on its course with a gyro-like grip—and assuring recovery during tests—is a specially-designed Autonomic Pilot created by Sperry. Like its relative, the famous Sperry Gyrostat® Flight Control, favored by the military and testing airlines, this electronic "brain" is sensitive to the slightest wind change in the flight path. Under its command, powerful servos or "muscles" of the control system

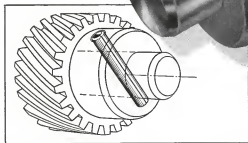
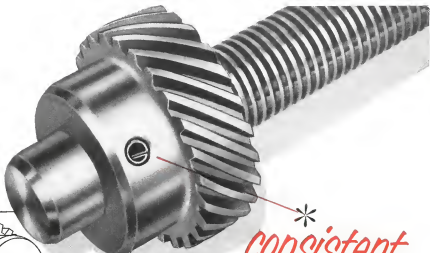
make instant corrections—By Regulus unfurling through intricate maneuvers at all speeds and in all directions.

There's a mighty difference between the automatic controls created by Sperry for the newest guided missile of the Navy, and those provided by Sperry for the Navy's first guided missile back in World War I days. But they're alike in this respect. Both resulted from an unmatched combination of skillful engineering, plus specialized experience in electronics and gyroscopes, and precision in production.

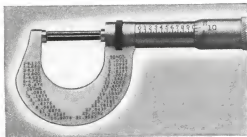
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To function effectively, a spring pin must drive easily into holes drilled to normal production tolerances, compressing as driven. To drive easily, hold firmly and fit flush, the pin—every pin—must meet the strict requirements of specifications such as those prepared by the SAE and the Military Services.



Since failure of a pin can be as costly as a failure of any other precision part, it is important to check the pins you buy for uniformity . . . uniformity of diameter and length, shear strength, hardness, insertion and removal forces, and recovery of diameter.



as a rivet

ROLLPIN
TRADEMARK



a hinge pin



a dowel



a set screw

*consistent
quality*

is as important
in the pin as in
the gear

Rollpin has been tested many times—by many manufacturers—with a consistently high performance record. It has been widely recognized as the “quality” fastener of its type. In this case, quality can be—and should be—measured. We strongly urge that you test for quality when buying spring pins.



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OF AMERICA**

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- ☐ Rollpin samples ☐ Here is a drawing of our product.
☐ Rollpin bulletin ☐ What self-locking fastener would you suggest?

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